

Economics of Solid Waste Management

The General Plan and Solid Waste Management

In Sunnyvale, the General Plan serves as the City's vision for both short- and long-term policy setting, budget planning, service delivery, and evaluation. Virtually every decision made by the City Council and every major assignment undertaken by City staff is designed to take the City one step closer to implementing its vision, goal, or plan of action. While most cities are required by state law to prepare a general plan outlining the direction of their community, few, if any, use the document like Sunnyvale does: as a foundation of all City planning and budgetary action.

The General Plan is composed of seven Elements: Transportation, Community Development, Environmental Management, Public Safety, Socio-Economic, Cultural, and Planning and Management.

Each Element has a series of Sub-Elements (e.g. Solid Waste is a Sub-Element of Environmental Management) in which long-range policy-making is developed and ultimately put into action via legislative decision (city ordinance, zoning changes, etc.) and budgetary allocations (capital improvement projects, funding of additional staff, etc.).

The City budget is viewed as a tool to implement the General Plan. It is a service-oriented budget, designed to focus on the desired level of service provided to the community at a specific cost. The City budget is designed to communicate whether services provided implement the goals, policies, and direction that the Council believes is important to the community, as reflected in the City's long-range plan.

Providing Solid Waste Service as a Municipal Utility

Solid waste management is one of the most costly expenses for the City. The Solid Waste Program has the largest budget of any City programs, at \$22.0 million in Fiscal Year 1995-96, not including various expenses related to handling and disposal of waste from Mountain View and Palo Alto for which Sunnyvale is reimbursed by the other cities. The Solid Waste Program budget is exceeded only by the \$32.8 million budget for the entire Department of Public Safety and the \$27.2 million budget for the rest of the Department of Public Works.

Costs for refuse collection, transfer, processing, disposal, recycling, source reduction, household hazardous waste programs, post-closure maintenance of the Sunnyvale Landfill, and the costs for administering the solid waste system are all included in the Solid Waste Program budget (the costs of each major area

of the Solid Waste Program budget are shown in Figure 3). The budget for operation of the solid waste management system is developed and approved along with the entire City budget. Capital projects are budgeted as part of the City's Capital Improvement Program. Due to the high costs associated with replacing the franchised hauler's collection vehicles, the refuse collection franchise agreement includes detailed depreciation and replacement schedules showing the date at which each collection vehicle is to be replaced, along with the estimated purchase price. This schedule is reviewed annually and any changes to the type of equipment or the schedule for replacement must be approved in advance by the City.

The SMaRT Station also has a long-range plan for replacement of the various components of the City's investment in the facility. This plan includes an equipment replacement reserve that is funded by the cities of Sunnyvale, Mountain View and Palo Alto in proportion to their original investment in the SMaRT Station. Over 30 years, the fund will pay for replacement of items such as the refuse compactor and conveyors, the various components of the materials recovery facility, the roof, and the specially hardened concrete floor. Past and anticipated expenditures, inflation assumptions, and interest earnings are reviewed annually by the three cities so that contributions to the fund are maintained at a level sufficient to maintain a positive balance until the three city Memorandum of Understanding expires in 2021. The present level of contributions to this fund will not provide for the replacement of the SMaRT buildings themselves in 2021, when they will be ready for replacement or rehabilitation. Determining the future of the SMaRT Station after 2021 and how to finance its rehabilitation at that time is an issue that should be examined in conjunction with the City's review of its refuse disposal arrangements, which also potentially expire in 2021.

As with all City operations, a twenty-year budget forecast is prepared. This forecast shows the expected trends in revenues and expenses for the program. The budget is used to project the trend of future garbage rates, allowing rates to be increased incrementally to provide rate stability and predictability. At the time the budget for Fiscal Year 1995/96 was prepared, rate revenues were projected to increase by 5.06% per year through 2003/04, and by 4.55% annually thereafter.

The entire Solid Waste Program budget is funded almost entirely by user fees collected through garbage rates. Figure 4 illustrates the sources of revenue to the Solid Waste Fund (disregarding reimbursements from the cities of Mountain View and Palo Alto). In Sunnyvale, the City acts as a Municipal Utility as it provides garbage service, then bills and collects the service fees directly from the customers. Billing and collecting of garbage service fees are performed by the City's Finance Department as part of the City utility bills (which also include water and sewer fees). The funds collected are placed in the Enterprise Fund

Solid Waste Program Expenditures 1995/96

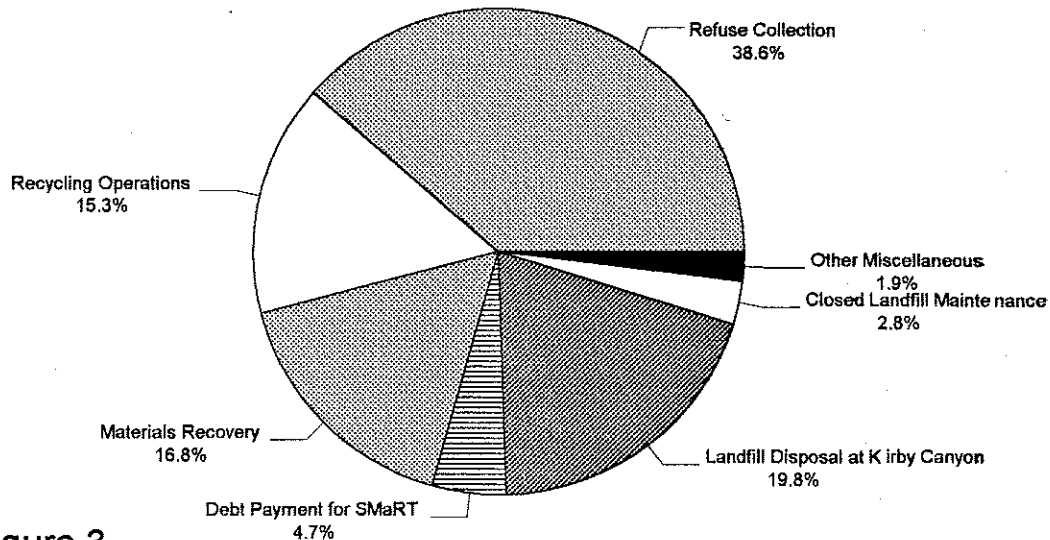


Figure 3

Solid Waste Program Revenues 1995/96

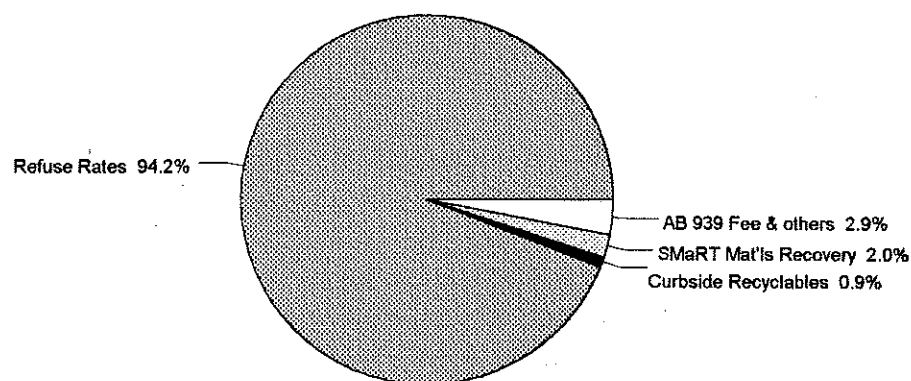


Figure 4

for Solid Waste. This Fund is managed and administered by the Solid Waste Program Manager in the Department of Public Works.

Garbage collection rates are established annually by the City Council. A comparison of the monthly garbage rates for a single family home in Sunnyvale and neighboring cities in 1995 is as follows:

<u>City</u>	<u>Monthly Garbage Rate (unlimited or 3-can service)</u>
Palo Alto	\$51.50
Los Altos	\$50.04
Cupertino	\$41.30
San Jose	\$37.50
Mountain View	\$33.00
Sunnyvale	\$24.89
Santa Clara	\$19.40
Milpitas	\$17.44

Sunnyvale bases its utility rates on the actual costs of providing service to customers. Utility rates for some other cities are not based on costs of service, and some categories of customers may subsidize other categories. For example, in the table above the Santa Clara rate does not pay for all garbage and refuse services in Santa Clara, and certain services are tax supported.

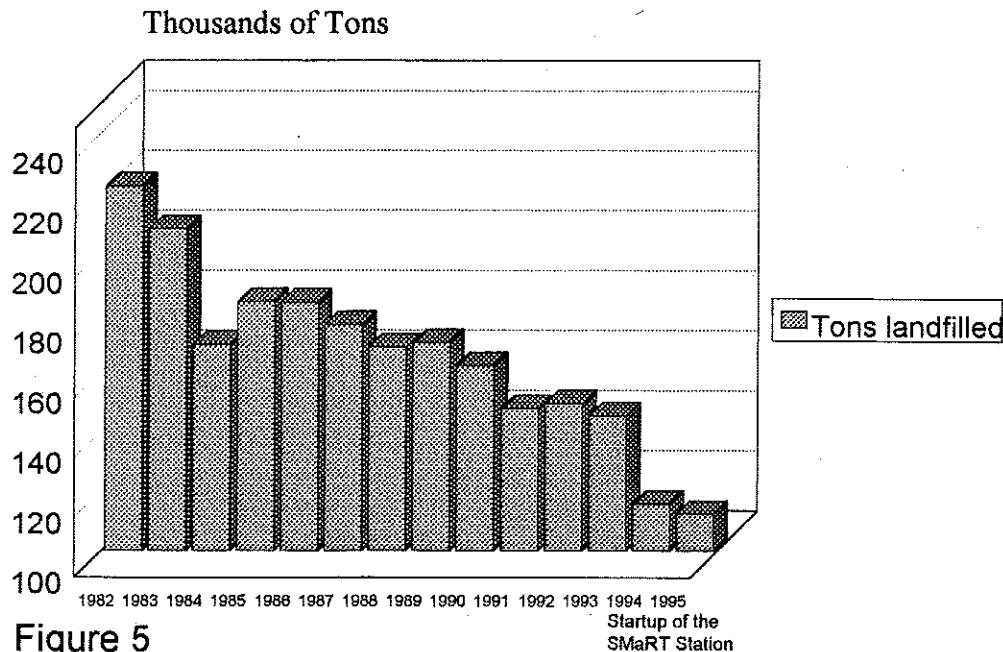
Periodically, the City reviews the methodology used to calculate the garbage collection rates to ensure that the rates reflect the actual costs of providing services. City staff constantly monitors and evaluates each component of the solid waste management system in order to deliver each service at the lowest possible cost. When new programs are considered, a cost benefit analysis is prepared to determine whether the results expected from the program justify the costs.

The cost of service methodology is also used in setting the Gate Fee at the SMaRT Station. When residents from the three cities bring in and dispose of their waste at the SMaRT Station, they will be charged a Gate Fee. The Gate Fee is determined by the volume and composition of waste materials. There are a number of waste categories, each charged at a different per cubic yard basis. The rates for these waste categories in turn are set according to the City's costs in handling, transport and disposal of the waste. Since most of these costs are weight-based, the per cubic yard Gate Fee for a waste category like concrete is much higher than that of general refuse because of its higher density.

Establishing rates tied to the cost of service also encourages residents and businesses to source reduce and recycle to avoid paying additional refuse

collection and disposal fees. This financial incentive to reduce the amount of waste generated has caused many residents and businesses to greatly reduce their waste generation and level of refuse service. The impact on the City's Solid Waste Fund over the past ten years has been a shrinking revenue base. Figure 5 illustrates how the amount of refuse landfilled has declined since 1982. During the same time, costs increased due to inflation, new source reduction and recycling services, and capital projects needed to comply with federal and state mandates to divert materials from disposal and mandates affecting closure and post-closure maintenance of the Sunnyvale Landfill. One of the greatest challenges facing the City over the next decade will be to minimize expenses in order to keep rate increases reasonable while the number of tons flowing through the system decreases.

Tons Landfilled 1982-1995



Role of "Demand Management" in Refuse Rate Setting

As noted above, the garbage rate structure will continue to be analyzed periodically to ensure that costs are allocated to rate-payers according to policies set by the City Council, and to verify that these policies remain valid.

The related concept of "demand management" should also underlie solid waste policy and rate-setting decisions. Demand management is the application of market-oriented principles of supply and demand to the pricing of services. The City's existing solid waste policies and practices contain many instances of the use of demand management to influence customer behavior. Some examples are:

- The collection, at no additional charge, of unlimited quantities of curbside recyclables, source-separated yard waste, and commercial cardboard encourages customer use of these services and diverts materials that have been separated from refuse. Because customer cooperation is desired, barriers to participation are kept low.
- The collection of refuse, an activity in which the City would like to see a reduction in tonnage, is charged to customers at rates that reflect both the direct cost of collecting and disposing of the refuse and the cost of recycling programs, which is allocated to customers on the basis of how much refuse they produce. This rate structure gives customers a financial incentive to reduce refuse outputs.
- By requiring only the purchase of a business license by private sector recycling companies, the City hosts a large number of private sector recycling service providers, thus encouraging businesses to reduce their waste disposal costs by recycling discarded materials.

Along with rates and policies, customer service quality plays an important role in demand management. Particularly for residents and those small businesses that may see little direct financial benefit from recycling and other diversion activities, the City should provide recycling services that are convenient and fulfilling. Residents and small businesses should be viewed as volunteers donating their time and efforts to help the City reach its solid waste diversion goals. In each step of the process, from ordering recycling containers to the collection of the recycled materials to providing promotional feedback to customers, recycling and yard waste customers should find simple, easy to follow procedures; customer should be made aware that their actions are appreciated.

The principles of demand management should continue to be applied to the City's solid waste management policies and should be incorporated into future decisions regarding rate structures, the future of the unlimited residential refuse collection service option, and provision of "free" services such as spring and fall cleanup events.

Solid Waste Management and Economic Development

Businesses are becoming increasingly aware of the cost of waste disposal. Increasing landfill costs, which lead to higher refuse collection rates, are motivating businesses to source reduce and recycle. Numerous Fortune 500 companies have adopted corporate strategies to generate "zero waste" within the next ten years. These companies view solid waste as lost profits or wasted assets. They are looking for ways to design their products and their manufacturing processes to minimize waste and reuse materials now being disposed. During the public participation event for commercial customers, many larger industries in Sunnyvale have their own comprehensive recycling programs. The City has already experienced a significant reduction in the quantity of commercial and industrial waste being disposed because of that. This trend is expected to continue, although at a slower pace, since businesses have already implemented the most cost-effective changes.

This new attitude toward reducing solid waste combined with sharp increases in the cost of refuse disposal has resulted in creation of waste reduction, reuse, and recycling programs at large companies such as Lockheed-Martin, Hewlett-Packard, AMD, Macy's, Marriott Hotels, Sun Microsystems, and Apple Computer. Through internal recycling programs, reuse of shipping containers, and other practices, such companies have sharply reduced their waste disposal. Lockheed-Martin's Sunnyvale facility, for example, has reduced its solid waste volumes by 80% through increased recycling. This voluntary reduction in the quantity of solid waste generated will impact the future quantity and composition of solid waste requiring processing and disposal in Sunnyvale.

The increased business awareness of refuse disposal costs is producing a response in the business community beyond "industrial ecology's" increased recycling and source reduction. The increasing expense of solid waste management, as reflected in higher refuse collection rates, has the potential to affect the City's efforts to attract and retain commercial and industrial facilities. Just as businesses are keenly aware of the cost of electricity and business licenses as factors in deciding where to locate, they are beginning to realize that the cost of refuse disposal can be significant and can vary depending upon where they operate.

In Santa Clara County, collection rates can vary significantly from city to city depending upon the level of solid waste management services and how each city funds its solid waste management program. For example, the cost per pickup of industrial refuse will appear to be higher in a city like Sunnyvale (which uses an enterprise fund approach to charge all solid waste costs to solid waste collection customers) than in a city that uses general fund money [tax revenues] to pay for a significant portion of the solid waste services it provides and does not regulate rates for collection of industrial refuse. The final total cost to the

industrial customer may be similar, but in another city, the industrial customer may be paying (in addition to its refuse collection charges) property taxes or a business license fee that provides post-closure maintenance for a closed landfill owned by the city, household hazardous waste events, or other solid waste programs.

In Sunnyvale no tax monies are used for this purpose and expenses for landfill post-closure maintenance are funded by the refuse collection fee. In addition, because Sunnyvale's tax revenues are not used for solid waste management, more General Fund revenue is available to fund a higher service level for other City functions such as libraries, public safety, street maintenance, parks, and so on. The advantages of the City's enterprise fund method of funding solid waste services include:

- Clear statement to the customer of all solid waste management expenses; no hidden charges, emphasizing City accountability
- Directly charges the users of the system for costs they incur, as opposed to charging on the basis of land ownership, taxable sales, or other measures that may not be related to the cost of service to a particular customer
- Allows tax revenues to be used for more appropriate general expenditures such as public safety, libraries, street maintenance, etc.

Moreover, in response to consumer demands for more recycling and more "environmental" approaches to product development, many manufacturers are now designing with an eye to recycling when their product's life is completed. Designers are also creating more durable products. The City should closely track these trends and use its knowledge in designing solid waste facilities and programs so that the facilities and programs can effectively handle the materials that will be in the waste stream in the future.

Other manufacturers respond by making household items that are more durable or reusable. This trend will also impact the quantity and types of solid waste that the City's solid waste system will be handling in future years.

Search for Efficiency and Additional Sources of Revenue

In order to deal with the shrinking waste stream and a continued increase in program expenditures, the City will need to consider various methods to increase efficiency. One way is to reduce fixed operating costs, where possible, to reflect the reduced tonnages. This cost reduction may mean eliminating refuse collection routes, switching to automated refuse collection service to reduce labor costs and other measures that will increase collection efficiency. Testing of

"single-pass" vehicles, to reduce the size of the fleet for collection of refuse, recyclable materials, and green waste, may also be considered. Such vehicles might, for example, collect refuse and recyclables in a single, multi-compartment truck. A combined refuse/recyclables collection truck was tested by the City in 1992 and found to be less cost-effective than separate vehicles. However, further advances in this area are anticipated as other communities grapple with this issue. The City should remain alert for new opportunities to reduce collection and other costs.

Other than searching for efficiency, the City can also seek out additional sources of revenue. Potential sources include development of new markets for existing recovered materials as well as searching for markets for new categories of materials to be recovered.

The closed Sunnyvale Landfill can also offer opportunities in revenue generation from its post-closure use. For example, the current concrete recycling operation on the East Hill benefits the City not only by diverting concrete and asphalt from the waste stream and hence avoiding expensive landfill disposal costs, but also by generating a per ton royalty for materials brought onto the site. Another project already underway is the Power Generation Facility at the WPCP. The planned facility will utilize digester gas from WPCP operation and landfill gas collected from the landfill to generate electricity. The power generated will be more than sufficient for the WPCP's demand and the excess can be provided to the SMaRT Station or other industrial users.

Significant physical and regulatory constraints limit future generation of revenues from use of the closed landfill. These constraints include:

- The need to protect the clay cap over the surface of the landfill and to maintain access to the cap for inspection and repair purposes.
- Differential settlement of waste materials and restrictions on use of irrigation water make placement of structures or playfields on the landfill problematic.
- The presence of landfill gas requires use of specific design and construction techniques and ongoing monitoring and maintenance to protect the public from the explosion potential and other risks posed by landfill gas.

For these reasons the closed landfill may not be suitable for some revenue-generating uses, such as office buildings that would be possible on other, non-landfill sites.

Future Solid Waste Management Issues

Changing Waste Stream

Quantity

Typically, if other factors remain the same, the quantity of solid waste generated within a city is a result of the following factors:

- **Population:** As the number of people living in a city increases, if there is no other change in people's behavior, waste generation increases.
- **Retail sales levels:** If sales increase, waste generation increases as product packaging is discarded and the articles being replaced are discarded.
- **Industrial output levels:** As more goods are produced, manufacturing wastes and other related wastes (advertising materials, packaging from raw materials, etc.) are produced.
- **Vibrancy of the local economy:** The nature of the industries located in a city and the occupancy levels of commercial and industrial properties affect the amount of waste generated.
- **Real estate development, redevelopment, and remodeling:** Clearing of land, demolition of existing structures, and construction all produce significant amounts of waste, which are in turn affected by interest rates, land use policies, and the general health of the local economy.
- **Weather:** Rainfall amounts greatly influence the amount of plant trimmings ("garden wastes") generated and the moisture content and hence weight of other types of solid waste.
- **Packaging decisions by manufacturers of goods consumed in a city:** Decisions made by manufacturers of goods shipped to a city from distant locations, such as detergents or restaurant supplies, increase and decrease local waste generation.
- **Natural disasters (floods, freezes, earthquakes, windstorms):** All such natural events increase the amount of solid waste generated.
- **Community income and wealth:** The more affluent and confident consumers are, the more waste they produce.

While the conventional belief that increased city growth and a healthy economy will generate additional waste is still true in general, fluctuation in waste stream quantities no longer tracks directly with economic growth or the amount of new

housing. With the advent of increased recycling and waste reduction programs, growth in the waste stream due to economic and/or population growth is offset, to varying extents, by source reduction and recycling efforts.

Quality

As with the quantity of solid waste, the composition of the City's solid waste is affected by a number of factors largely outside the City's control. The difficulty of anticipating future changes in waste composition in a twenty-year planning document is best illustrated by looking at the past twenty years and observing the significant changes in the City's waste composition. For example, in 1975, glass bottles were used extensively for soft drinks, food, shampoo, vitamins, and numerous household items. Glass recycling was still in its infancy, so glass comprised a significant portion of the waste stream. Twenty years later, the above-listed products are all available in plastic containers. The quantity of plastic in the waste stream has increased significantly and the quantity of glass has decreased.

In 1975, the typical office used electric typewriters to produce letters, memos, and reports. Bond paper and carbon sheets comprised a large portion of the waste stream from banks, insurance companies, real estate agents, and large companies. Twenty years later, computers and laser printers have replaced typewriters, along with the ubiquitous photocopying machine, making it easy for office workers to generate large numbers of copies of documents. Carbon paper has almost completely disappeared from the waste stream.

The City's solid waste system should remain flexible so it can adapt to changes in the waste stream.

"Flow Control"

As noted above, businesses, refuse collection companies, and recyclers now view the "waste stream" as a "resource stream." This trend has led to arguments over ownership of the waste, a hotly contested topic in the courts for many years that is likely to be addressed by legislation at the state and federal levels. New legislation and judicial decisions will impact the manner in which the City manages the waste stream. Changes in contracts, the City Code, and Solid Waste Program funding sources may be needed to comply with new legal decisions and adapted to address the ownership of the resource stream.

At the state level, the 1994 decision by the California Supreme Court in the case of *Waste Management of the Desert vs. Palm Springs Recycling* indicated that recyclables must be viewed as tradable commodities under the control of the waste generator if they are purchased or collected at no charge by a recycler. Sunnyvale's existing policies are consistent with the Court's ruling, but it is

expected that this expansion of "recycling rights" will continue and it is possible that some future court decision may change the City's policies.

Of far more concern, at the federal level, the U.S. Supreme Court ruling on May 16, 1994, in the case of *C&A Carbone, Inc. vs. Town of Clarkstown* declared that a local jurisdiction could not, by way of an ordinance, mandate that all of the waste within the jurisdiction be disposed at a specific facility. While the specific ruling in the *Carbone* case has little immediate impact on Sunnyvale, the Court's ruling was stated broadly and raised many questions regarding the appropriate role that a local jurisdiction should play in the solid waste management arena. The full impact of the Court's ruling and its long-term impact on the City's power to grant an exclusive franchise for refuse collection, to set customer rates, and to fund an integrated solid waste management program with user fees may depend on the ultimate resolution of a number of lawsuits filed around the country in the wake of the *Carbone* decision, as well as current federal legislation being proposed to clarify the role local government can play in solid waste management. Because it potentially threatens the City's ability to pay for source reduction, recycling, and household hazardous waste services, and the \$21 million debt for the SMaRT Station, the City should take a vigorous, proactive stance toward influencing legislation on the topic of flow control.

City control over the handling of wastes generated in Sunnyvale is also of great importance to the City and its ratepayers due to the liability associated with the federal Superfund law. If refuse generated in Sunnyvale is disposed of at a site that later requires remedial cleanup, the City may have a virtually unlimited liability for the cost of that cleanup, regardless of how large or small a role the City played in handling the refuse. This fact gives critical importance to City policies that affect the ultimate disposal site for Sunnyvale refuse. Large industrial waste generators would likely be named directly in any cleanup actions, and these waste generators tend to share the City's concern about the integrity of disposal sites. During the focus group discussion, when asked to rank fourteen solid waste management issues, facility managers of six large Sunnyvale industries ranked "Avoiding long-term disposal site(s) cleanup liability" as their top concern.

The City's decision to enter into a long-term contract with Waste Management was driven in part by the technical qualifications of that company and the compliance of Kirby Canyon Landfill with the most recent standards for landfill construction, operation, and monitoring. Future City decisions and policies that affect where Sunnyvale wastes are disposed should likewise consider not just the immediate cost of disposal but also the potential for long-term environmental cleanup liabilities.

City Diversion Objective

A key issue the City faces in light of the state's current AB 939 diversion requirement is the City's own waste diversion policy. Should the City adopt whatever diversion goal is currently required by the state? Or should the City independently set a diversion goal that may exceed the state's minimum requirement? The City could also adopt a Legislative Action Statement promoting legislative changes in the state-mandated diversion requirements. This issue is important because the state's minimum diversion requirement may increase or decrease over time, and because it will be more cost-effective for the City to target a particular diversion level without changing the goal frequently.

The California Integrated Waste Management Board (CIWMB) has proposed regulations containing a mathematical formula to calculate the diversion achieved by each city and county in California, using the number of tons landfilled in the baseline year (1990) and in 1995. The formula calculates the total reduction in tons landfilled. It also includes an adjustment to waste generation for population changes and employment since 1990 and for inflation-adjusted increases or decreases in taxable sales. This waste generation number, calculated after the end of each year, will be compared with the actual amount of waste disposed (landfilled) to determine the percentage of waste disposed and thus the percentage diverted. The 1993 and 1994 figures calculated by City staff are shown below:

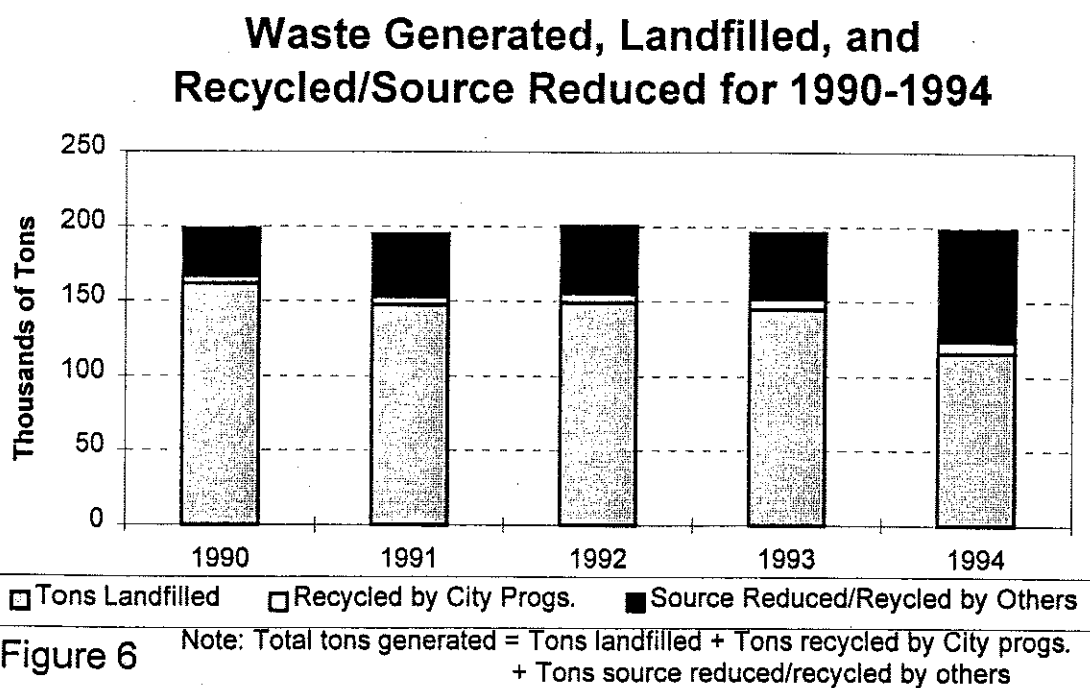
		<u>1993</u>	<u>1994</u>
	(Calculated) Waste generation	= 196,167 tons	198,238 tons
Less	(Actual) Waste landfilled	= 144,814 tons	115,601 tons
Equals	Waste diverted	= 51,353 tons	82,637 tons
	Percentage diversion:	26%	42%

Thus in 1993 the City had, two years in advance, exceeded the 25% diversion level mandated for 1995.

City staff makes an annual calculation of diversion achieved, using the CIWMB regulations and formula. In 1993, the most recent year for which all adjustment factors are available, the City's diversion rate was at 26%. As of spring 1995, the combination of City-funded recycling programs, private sector recycling programs, and materials recovery operations at the SMaRT Station has resulted in an estimated diversion of 45% of the City's solid waste, when compared against the 1990 tonnages. Figure 6 shows the tons of waste generated, disposed, and diverted for the years 1990-1994. Additions to the City-funded recycling programs may be needed to reach the 50% diversion mandate for the

year 2000. The respective diversions achieved by City-funded recycling and source-reduction programs in 1995 are as shown in Figure 7. The tonnage being diverted from landfill in 1995 by City-funded recycling and source-reduction programs is estimated to be 50,569 tons. In order to achieve the 50% diversion mandate, the diverted tonnage from City-funded programs will have to be increased significantly. This means addition of new recycling and source reduction programs and expansion of existing ones. The total City cost and the cost per diverted ton would increase as higher percentages of recovery are achieved.

At low diversion levels, programs that collect source separated materials or recyclables that have strong market demand are profitable, or if not profitable, have a low overall cost per ton. Moving diversion to higher percentages results in a higher cost per ton for diversion as the recovered materials will be more difficult to segregate and/or more difficult to market. Figure 8 illustrates this concept.



Diversion by City-Funded Recycling Programs in 1995

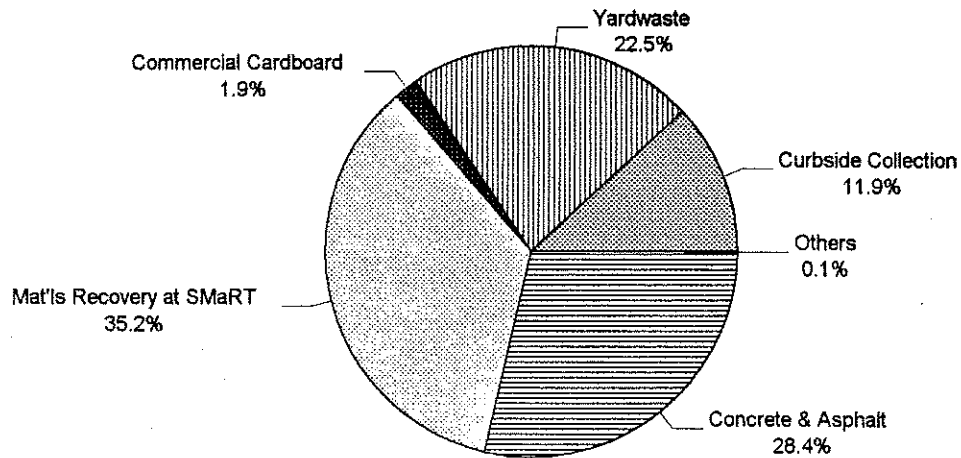


Figure 7

Diversion Cost Per Ton vs. Diversion Achieved

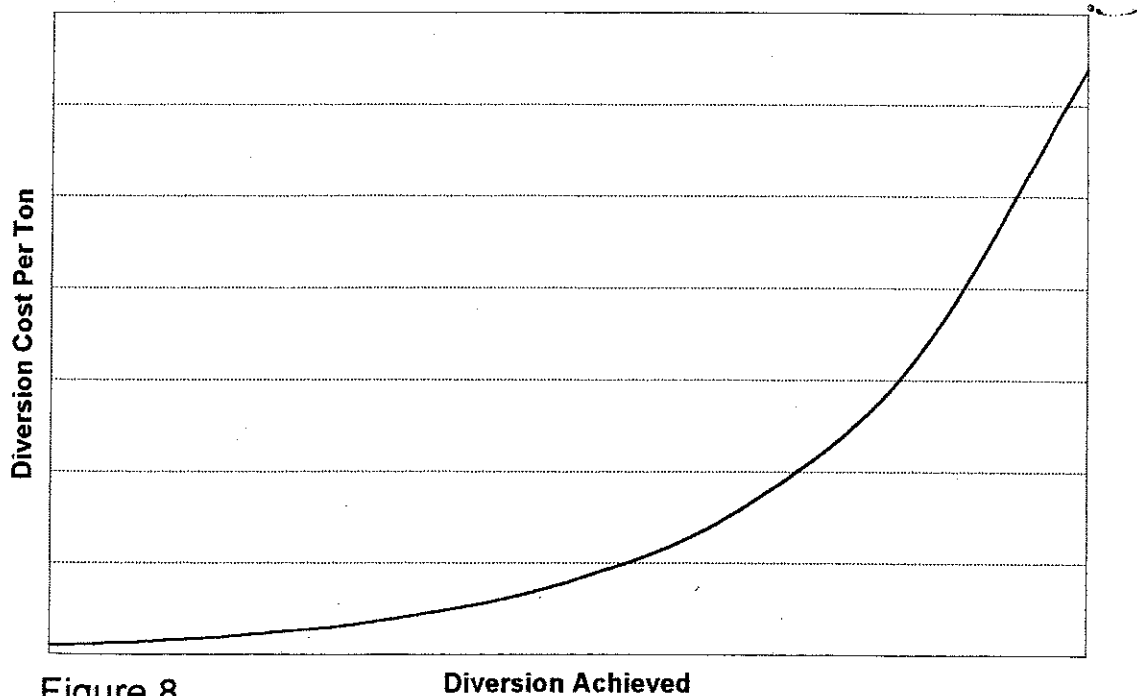


Figure 8

The City could elect to establish a policy of diverting a predetermined percentage, regardless of what the current (or proposed) legal requirement is. In this case, instead of attempting to aim for a "moving" target, the City would commit itself to a diversion level. Private business is opting for this type of policy as the price of pollution and the risk of environmental impairment from waste generation increase. Other businesses such as manufacturers, hotels, restaurants, and retail and grocery stores are finding that reduced disposal costs through recycling and waste reduction programs are essential to remaining competitive.

The Fiscal Sub-Element likens the City's approach to fiscal management to that of a business. Just as business sees a need to reduce pollution and reduce costs for waste collection and disposal, so the City could adopt its own diversion goal, which could be equal to or higher than the current State mandate (50% by the year 2000). If accomplished in partnership with businesses and residents, such a policy could result in large future savings. For example, the 1995 marginal cost to the solid waste system for transfer and disposal of one ton of solid waste was approximately \$67. If a recycling or diversion program could be implemented at a cost of \$67 per ton, it would be cost-effective to implement the program.

In addition, the City's Kirby Canyon contract allows the landfill operator to pass through to the City any cost increases due to regulatory changes. These cost increases will apply to incoming solid waste as well as "in place" solid waste disposed in prior years. It is likely that in the future new regulations will increase the City's costs for the "in place" solid waste. To the extent it can be predicted, this cost increase should be factored into calculations of the avoided costs of landfill when compared to the cost of additional diversion programs. Reducing the amount of solid waste for which the City is responsible in landfills in the future may be the most cost-effective way to manage the cost of complying with future environmental regulations. Any decision on adding or deleting City diversion programs should be based on analysis of the marginal costs and benefits that would be realized.

Enhancing Source Reduction and Recycling Programs

There are numerous factors affecting the City's source reduction and recycling programs. One of these is the increased investment of both foreign and domestic companies in the recycling and reuse infrastructure. During the 1970s and the early 1980s, much of the paper collected by recycling programs on the West Coast was shipped to Asia. This recycled paper represented a small percentage of the feed stock for most foreign mills and was used at low rates in U.S. paper mills. The federal income tax system was (and still is) structured to

provide depletion allowances and other tax incentives to the timber industry, so that vertical integration between domestic timber companies and domestic paper mills was common. Recycling was viewed as a "fad" by many decision-makers and few reliable sources of used paper were available to the paper industry. The vast majority of paper mills were engineered and constructed to produce paper from trees.

In the late 1980s and early 1990s, this situation changed dramatically. A decade of successful recycling programs had demonstrated that a large quantity of high quality used paper was available for use as a recycling feedstock. Timber production was restricted in some areas due to concerns over the destruction of old-growth forests and endangered species that use the forests as their habitat, thus driving up the cost of virgin raw materials traditionally used to manufacture paper. The environmental sustainability of the paper industry was questioned. In order to create markets for recycled materials, several states (including California) passed "minimum recycled content" laws requiring paper manufacturers to include a minimum quantity of recycled paper in the production of new paper.

Together all of these changes led to decisions by many U.S. and foreign paper mills to retrofit their paper-making equipment to utilize used paper. This decision involved a commitment of billions of dollars industry-wide to retrofit mill equipment. It was a significant investment that changed the paper industry.

Most of these retrofits and new mill construction projects have been completed and paper mills are utilizing used papers at the highest rate ever. The huge investment in this recycling infrastructure has changed the used paper market permanently. There will now be a strong, continuous demand for used paper by both foreign and domestic paper producers. Hence the City's recycling programs can expect more reliable paper markets in the future. While used paper prices will continue to fluctuate (like any commodity traded on a global basis), it is likely that reliable markets for used paper will be available in the future.

Another factor that affects the City's solid waste management system is the market conditions for recyclables. Due to the global nature of its markets, recycling is one of the few instances in which a decision made on the other side of the globe may directly impact the City's revenues. The materials collected by the curbside recycling program and those separated at the SMaRT Station are sold either to a materials broker or directly to an end-user. The prices for glass, aluminum, cardboard, office paper, newspapers, and plastic bottles fluctuate daily like other commodities markets. Since the secondary materials markets are worldwide, events in other countries can affect the revenue the City receives for its materials. One example was when the former Soviet Union was disbanded, the stockpiled aluminum bars at Russian smelters were sold in a short period of time to raise capital. This unexpected action caused an over-supply of aluminum

in the market and the prices for both virgin and recycled aluminum fell significantly. Thus, the City received a reduced price per pound for the aluminum collected by the curbside recycling program. Once the stockpiles of aluminum in the former USSR were depleted, the market prices for recycled aluminum returned to their former levels.

This example illustrates that, even with extensive advance planning, the City will not be able to accurately predict market prices for recycled materials; revenues from sale of recyclable materials will continue to be difficult to estimate. This uncertainty in prices will, in turn, cause fluctuations in the net recycling program costs, which are partially funded by revenues from sales of recyclables. Figure 9 illustrates the loose relationship between the amount of recyclables collected by the City's programs and the revenues earned from the collected materials. With 1995's very strong markets, the graph shows that although tonnages declined due to thefts from the curb by scavengers, revenues nearly doubled due to higher values for the materials collected.

City Recycling Tonnages and Revenues

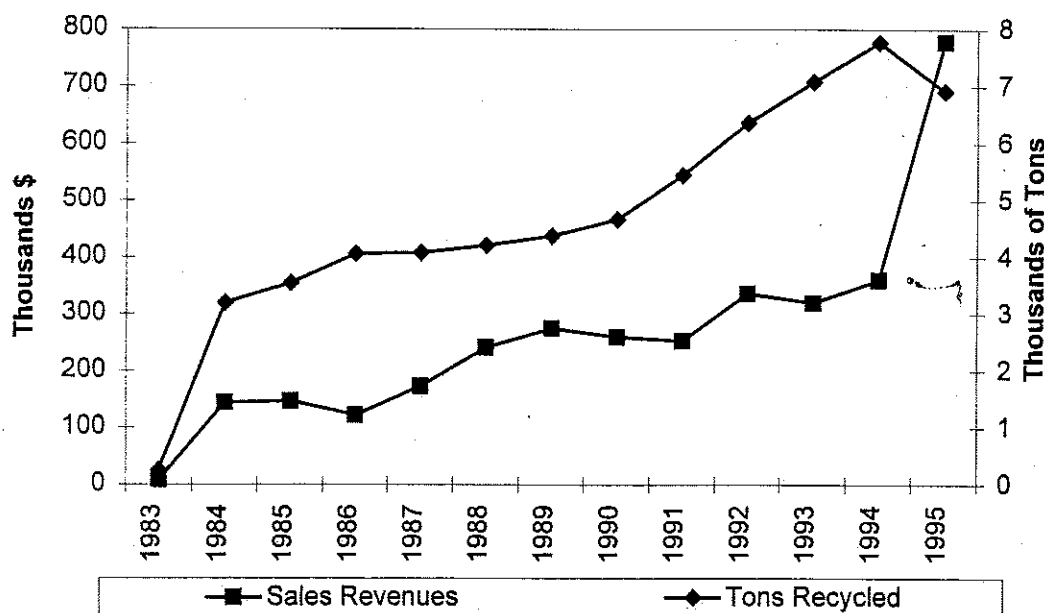


Figure 9

The City can influence markets through its legislative advocacy at both the state and federal levels. Legislative directives to eliminate tradition-based barriers to use of recycled products and require minimum recycled content for key products can be effective in stimulating use of recycled products by both the private sector and public sector. The recent increase in demand for waste paper in the United

States is at least partially a result of mandates by California and many other states that publishers use newsprint that contains a minimum level (the minimum varies from state to state) of recycled content. In response to the mandate, and others like it throughout the United States, paper manufacturers have invested heavily in retrofitting mills to produce recycled content paper, thus stimulating demand and raising prices for recycled paper.

Similarly, California's 1987 "AB 2020" beverage container redemption law has resulted in increased recycling of beverage containers. The revenues generated through a point-of-purchase fee of 2.5¢ per can or bottle provide the private sector with funds to operate convenient drop off redemption centers where residents can get back their "redemption values." Curbside recycling programs, including Sunnyvale's also receive payments for beverage containers that are picked up at the curb. This revenue improves the cost effectiveness of the curbside program and lowers the bottom line cost of the program from the point of view of City rate payers.

The City should support legislative efforts to both stimulate demand for recycled content products and financially assist recycling collection programs in ways that serve to reduce the overall cost to City rate payers.

Future Commercial Recycling Issues

Approximately 68% of the City's waste stream is generated by commercial and industrial sources. Waste generated by businesses usually has more concentrated amounts of recyclable materials than household refuse. This particular waste stream presents an opportunity for implementation of recycling and source reduction programs, which has already been partially realized with existing programs.

Given the current identifiable trends, both the amount and scope of waste diversion by business is expected to increase significantly from 1995 to 2010. This increase will come about as recycling and source reduction are incorporated into manufacturing and design processes.

The increased recycling and source reduction activities of industry will impact the Sunnyvale solid waste handling system in two ways: (1) the diversion rates mandated by the CIWMB will be more easily achieved; (2) the amount of waste and the associated costs for transfer and disposal will decrease.

The most challenging aspect of these impacts will be the redesign of the existing solid waste collection infrastructure and refuse collection rate structure to accommodate the decreased solid waste flow. This task requires a high degree

of attention since both the rate of waste flows and the timing of the changes are variable. The City could pursue several options as described below in order of least to most restrictive to businesses.

- *Open Collection of Commercial Recyclables*

This option, the existing condition, envisions the open collection of recyclables by any vendor that the waste generator (i.e. business) selects. The most powerful argument for this option is that it is in full compliance with recent legal decisions on the ownership of recyclables. The California Supreme Court has ruled that recyclable material becomes "waste" only when it is discarded, and that any material that can be sold or given away has "value" and thus is fully protected under private property precedents.

From a City revenue perspective, the drawback of this option is that collection fee revenues decline quickly as the amount of solid waste collected is reduced, while the cost of the City's collection system declines more slowly. The result is the fixed costs of the Solid Waste Program will be spread over a smaller revenue base, a fact already reflected in the refuse rate increases in recent years. This approach also leaves the general provisions of the Municipal Code as the only control over the side effects of collection. While the City has contractual control over the actions of the franchised refuse collection company, it has only the Code to address spilling of materials from vehicles and complaints about noisy collections at early hours of the morning.

- *Licensed Collection*

In this option, the City would issue licenses to recycling collection firms. The license would be issued to any company that meets normal business requirements. A license fee could be collected, but should not be so high as to be perceived as a barrier to recycling companies entering the Sunnyvale market. This approach has a high degree of compliance with recent legal decisions and still allows Sunnyvale businesses the opportunity to recycle. There are some administrative costs associated with this option. The City will still see a reduction in its collection fee revenues and upward pressure on collection rates as in the current situation. One advantage of this approach is that it provides the City with a measure of control over the quality and timing of the work provided by licensees. Another is that some, albeit small revenue would be generated to help balance the rate revenues lost as a result of a shrinking refuse customer base. Otherwise, a shrinking base of refuse ratepayer must fund mandated solid waste management expenses, including recycling programs and landfill maintenance that actually benefit all residents and businesses.

- *Multiple Nonexclusive Franchises*

The City could issue multiple nonexclusive franchises for the collection of recyclable materials. A franchise fee similar in scale to that paid by the City's current refuse-collection contractor (approximately 10% of gross revenues) could be imposed to maintain revenue from franchise fees. This revenue would help to pay for mandated solid waste management expenses that would otherwise be borne only by refuse ratepayers. Franchise fees would also put all collectors of waste materials on an even financial footing, unlike the present situation where collectors of mixed recyclables have an artificial price advantage because the refuse hauler must pay the City a franchise fee. Like the previous option, multiple franchises would provide the City with more control over the time and manner of collection activities. Potential recycling franchisees may see the franchise fee as unfair because they are not being granted an exclusive right to collect recyclables in the city. Local businesses might also have concerns about this option if it prevented them from contracting with a particular vendor or if franchised recyclers raised their collection charges. The specific requirements for becoming a franchisee would need to be carefully crafted to ensure that this system complies with California law. The City would need to commit resources to enforce the franchising requirement and fee collection.

- *Add Collection of Mixed Recyclables to the Scope of Services Provided by the City's Refuse Collection Contractor.*

This option would add the collection of source separated and mixed recyclables from businesses to the City's contract with the refuse collection contractor, with the City setting up a new lower rate schedule for these more valuable materials and competing for business with the existing service providers. It would allow businesses to have mixed recyclables collected while maintaining revenues to the City via utility fees. It would also add to the quantity of recyclable materials processed at the SMaRT Station. The City receives revenues from the sale of these materials.

- *Allow Donation or Sale of Mixed and Source Separated Recyclables to Any Recycling Company.*

Under this option, private recyclers could only collect source separated or mixed recyclables from a business if the business donated or sold the materials. If a fee for collecting these materials was charged, the business would have to use the services of the City's contract refuse collector. This option would help to maintain revenue levels for utility fees. Businesses could assert that it limits the manner in which they can deal with their mixed recyclables, limits the vendors they can use, or increases their costs. This alternative would be resisted by those haulers presently being paid by Sunnyvale businesses to collect containers of low value "mixed recyclables."

In choosing a method of structuring its system for commercial recycling, the City must be certain that it is in compliance with the law and the evolving body of case law in this area. Regardless of which option is selected (even if it is to maintain the current policy of open collection of recyclables), the City will need to consider some form of enforcement program to make sure there is no more than an incidental amount of solid waste in any mixed recyclables that are collected. The enforcement will ensure proper collection and disposal of solid waste to protect public health and safety. If a significant amount of solid waste is disposed of as "mixed recyclables" outside the City's collection system, the garbage rates for other users will increase. There are no firm industry guidelines now as to the maximum allowable percentage of solid waste residue above which a container of mixed recyclables would be considered as a container of solid waste. Industry discussion on this topic has yielded various opinions that range from 2-50% solid waste by weight.

The City's Role as a "Model Recycler"

Because much of the City's efforts in increasing business recycling revolve around encouragement of source reduction and recycling by commercial and industrial waste generators, it is important for the City itself to take a leadership role in this area. The City should clearly state its commitment to source reduction and recycling in all of its operations, and direct employees to search out opportunities to divert waste from landfill disposal. Employees should be empowered to change procedures and practices that generate waste.

Future Residential Recycling Issues

Any changes to residential recycling and source reduction programs will depend upon the City's policy concerning the diversion level to be achieved. It is likely that some additional residential recycling and source reduction programs will be required to meet the existing legislative mandate of 50% diversion by the year 2000. Potential programs must also be evaluated in terms of waste stream changes and markets. The types of programs that are being considered for implementation include expansion and modification of existing curbside recycling programs. The City will evaluate potential programs in terms of the quantity of solid waste they divert and the costs. Depending on whether the City has achieved (or exceeded) its landfill diversion goal, programs could also be eliminated or modified with more diversion achieved through the material recovery capabilities of the SMaRT Station. In all such examples, cost-effectiveness would be gained at the expense of diversion, which would decline.

- *Modification of Existing Curbside Recycling Program*

Several possible modifications are being considered for the curbside recycling program. One is to add materials to the program to increase the tons diverted. Materials that could be added in the future include:

- mixed paper (junk mail, magazines, catalogues)
- additional plastics, especially the #2 high-density polyethylene plastic used in milk and water jugs

A second possible modification would be to phase out the curbside recycling program and sort glass, metals, plastics, and paper from the residential waste stream at the SMaRT Station. This option would eliminate the cost of the curbside program. However, it would reduce the quantity of recyclables recovered from the residential waste stream, because sorting at the SMaRT Station will not capture all of the material now collected by the curbside program. This reduced diversion would take the City farther away from, not closer to, the 50% diversion mandate. The public education aspect of the existing curbside program would also be lost under this option.

A third possible modification would be to retain the curbside program but cease the collection of items that are difficult to collect at curbside but can easily be recovered at the SMaRT Station, such as cardboard. The residential cardboard can be recovered at high "capture rates" at the SMaRT Station as part of its processing operations. This change could also allow for program expansion because removing cardboard would free up room on the collection vehicle for new materials.

- *Multifamily Recycling Program*

Additional diversion could be achieved by implementing a multifamily recycling collection program. Such a program would collect newspapers, glass, plastic bottles, aluminum and steel cans, and used motor oil from multifamily dwellings in Sunnyvale, which would be provided with appropriately sized containers for storage of recyclables. Residents would place their recyclables in large containers near the solid waste bin for weekly pickup by the collection vehicles. A portion of the materials captured by a multifamily recycling collection program is currently being recovered in a more cost-effective fashion by the materials recovery process at the SMaRT Station. However, the amount of diversion required to meet the 50% by 2000 mandate may not be achievable without the additional tons that would be recovered by a multifamily collection program. Inclusion of used motor oil in such a collection program is problematic in some multifamily settings where apartment or condominium rules ban on-site automotive maintenance by residents.

A multifamily recycling program has been approved in April 1996 and is expected to begin in October 1996.

- *Source Reduction Programs*

Several potential new source reduction programs are outlined in the Sunnyvale SRRE and could be implemented in the future. The backyard composting program could be expanded to more households. A program could be started to encourage the use of, or even furnish, durable shopping bags (cotton, plastic or mesh) to residents at a nominal cost. This program would decrease the quantity of grocery bags (paper and plastic) that are discarded in Sunnyvale.

The City could also promote the use of durable items instead of disposables. Included in this public awareness campaign would be the following: Use of durable razors instead of disposables; use of lunch boxes or cloth bags instead of paper bags; use of durable containers for food storage instead of aluminum foil and plastic wrap; use of cloth diapers instead of disposables; expansion of the City-Wide Garage Sale concept to promote the reuse of furniture, appliances, and equipment by Sunnyvale residents and businesses.

- *Garbage Rate Incentives*

Residential customers are provided unlimited refuse collection, yard waste collection, and curbside recycling service under existing garbage rates. While unlimited yard waste and recycling service can be viewed as assisting the City in its diversion efforts, unlimited refuse collection is in conflict with the City's goal of diversion. By not financially penalizing the generator of larger amounts of residential refuse, the City fails to manage demand for this service. Baseline service (one can per week) is available at a lower rate, but for those customers with large families or those who produce larger amounts of waste, there is no financial incentive to source reduce, recycle, or to separate yard waste.

In the future, source reduction, recycling, and composting could be encouraged by charging a unit price for extra refuse containers placed out for collection, while still offering unlimited yard waste and curbside recycling service. This rate structure would provide an economic incentive to residents to recycle and source reduce and would also make it more cost-effective for the City to use fully automated refuse collection vehicles. If all refuse is contained in City-provided carts, the efficiency of the collection workers using automated trucks is greatly increased because the driver rarely has to leave the cab and can serve more homes in the same period of time.

A similar unit pricing system has long been in place in the commercial/industrial sector. Collection rates are structured so businesses pay more for larger solid waste containers and/or for more frequent pickups.

However, such a policy may not be well-received by some residents, especially those that generate a large amount of garbage. It may also lead to increased illegal dumping activities and increased unsightliness (possibly even increased fire risk) from garbage accumulation.

Applying New Technologies

Secondary materials markets drive the selection of materials recovery technologies used by the City. A glass bottle or newspaper is not truly "recycled" until it is made into a new product. The City's recycling programs must collect and process materials so that they meet market specifications for quality, cleanliness, contamination levels, etc.

Recycling technology is constantly changing and will continue to do so. Debates will continue over the efficacy of "source separated collection" programs (where recyclable materials are separated from other solid waste by the waste generator) versus "materials recovery" (where mixed solid waste is delivered to a central processing facility, such as the SMaRT Station, to be sorted). These two strategies can be combined into an integrated program. The City's challenge is to integrate source reduction, recycling, and SMaRT Station recovery programs to most cost-effectively achieve the appropriate level of diversion of solid waste. The key is determining whether new source separated collection programs are more cost-effective than increasing the materials recovery systems at the SMaRT Station. By combining the most efficient options in these collection, MRF/Transfer, and markets components of the system, the City can achieve the most cost-effective solid waste management system.

Modifications to the SMaRT Station

The SMaRT Station was constructed to be sufficiently flexible to handle changes to the Sunnyvale waste stream expected over time.

Future changes to the SMaRT Station may be needed to complement changes to the refuse and recyclables collection systems. For example, if the curbside recycling program is expanded, the Station may need to be modified to process the additional materials.

The Station operating procedures can also be modified to sort new materials from the waste stream as markets become available for those materials. Sorting operations at the Station are flexible and change in response to the markets available for the recovered materials.

Changes to the Solid Waste Collection System

Changes to the solid waste collection system may be warranted to increase collection efficiency, decrease costs, and improve worker safety. These changes may include expansion of automated solid waste collection, co-collection of solid waste and recyclables, and other modifications to the collection system.

- *Automated Collection*

With the City's approval, in August 1995, the solid waste collection contractor placed into service three fully automated collection vehicles. The results of a test conducted in 1994 indicated that automated solid waste collection is cost-effective in many neighborhoods of the City. The advantages of automated collection are that it speeds collection and reduces worker injuries, thus reducing workers compensation costs. A mechanized arm on the truck picks up a City-provided refuse cart, empties it into the truck, and returns the cart to the curb. The driver does not have to exit the vehicle to handle solid waste containers, except for baseline or rear yard customers, instances where the cart is out of the reach of the mechanical arm, or when additional cans or bags are set out for collection.

To achieve maximum efficiencies from automated collection, all solid waste should be in standardized containers that the mechanized arm can pick up. If the City-provided "toter" refuse carts are not used, the driver must exit the truck and pick up the cans, boxes, or bags. The additional time spent will work against the reasons for implementing automated collection, which are increasing collection efficiency and reducing driver lifting.

Unless collection day parking restrictions were implemented in order to keep parked cars at the curb from limiting the reach of the mechanical arm, some neighborhoods with heavy on-street parking may not be suitable for automated collection. However, it appears that the automated service would be feasible in many parts of the City without parking restrictions. Implementation will result in cost savings for the solid waste collection system in the future.

- *Co-collection of Solid Waste and Recyclables*

Another trend being pursued in the solid waste collection industry is the creation of vehicles to collect solid waste, yard waste, and/or recyclable materials on one truck. Depending upon solid waste and recyclable materials volumes, co-collection vehicles may be more cost-effective because only one or two trucks circulate through the residential neighborhood instead of three. The technology for these types of vehicles is still in the pilot-testing stages.

The City should continue to research and evaluate alternatives that might eliminate one of the three collection vehicles (refuse, yard waste, and curbside recycling) presently necessary to pick up solid waste from single-family homes. The use of three vehicles, while promoting good quality control for recovered materials and providing clear program identity for the yard waste and recycling collection services, does have impacts on costs and on air quality. It is possible that an alternative collection configuration might provide the City with a more cost-effective collection system without significantly reducing the quality and quantity of recovered materials. Combining more than one type of material on a single truck typically shifts costs from collection to processing and may increase or decrease the labor component of the solid waste handling system depending on the alternative. Some alternatives would require substantial investment in trucks or machinery, while others would require retraining residential customers about separating wastes from recyclables. Any changes should be timed carefully or phased in over time to avoid rapid and expensive changes to the solid waste infrastructure.

- *Route Restructures to Increase Diversion by SMaRT Station*

Existing commercial solid waste collection routes could be restructured to segregate wet wastes (e.g. restaurant and grocery store waste) from the dry, more recyclable solid waste collected at offices, banks, and retail stores. One or more commercial front-load vehicles could be assigned to collect restaurant and grocery store waste. This change could result in some minor routing inefficiencies for the "wet" collection route. However, the increased revenues from noncontaminated recyclable materials recovered at the SMaRT Station could be well worth the additional cost.

Securing Future Disposal Capacity

As noted previously, the City has contracted for landfill capacity at the Kirby Canyon Landfill through the year 2021, with an option to extend the disposal contract to the year 2031 if the site operator is able to extend its lease for use of the land. Due to a concerted five-year effort by the City in the 1980s, Sunnyvale is assured of landfill capacity for at least 26 years.

The City carefully monitors landfill use by tracking the tons delivered on a monthly basis. The amount of remaining capacity is reviewed annually. Arrangements for new disposal capacity require a five- to seven-year lead time. Therefore, when the City reaches the year 2011, or is at the point where it has ten years of capacity remaining, efforts should commence to obtain additional landfill capacity.

In light of the significant changes anticipated in the waste stream over the next two decades, the City may also choose to explore disposal alternatives earlier. There may be new technologies or lower cost facilities for handling solid waste by the time the City's capacity at the Kirby Canyon Landfill is exhausted. The following are some identified technologies and potential options for disposal of the City's waste stream.

- New private landfills may be sited and available for use. It is possible that one or more public entities may work together to open a new landfill in the Bay Area. Such a proposal is being debated in Alameda County.
- As nearby landfills reach capacity and close, many cities are using longer truck hauls (in excess of 100 miles) and hauling solid waste by rail to more distant landfills. For example, a portion of the solid waste from Napa County is being hauled by rail to a landfill in Washington state, at a price similar to the City's disposal cost at Kirby Canyon. Even though it does not have a rail spur, the SMaRT Station's refuse compactor can easily be used to load intermodal containers that could be transferred to a train for shipment to a landfill hundreds of miles away.
- Another potential option is incineration, or other more exotic energy recovery technologies, such as pyrolysis. Numerous attempts were made in the 1980s to site incineration or waste-to-energy facilities in the Bay Area. All failed due to citizen opposition and/or regulatory constraints. Existing air quality laws and hazardous waste laws effectively prohibit incineration facilities due to the air emissions and potentially hazardous ash they generate. However, advances in new pollution-control technology could change this situation in the future.

The most important criterion in selecting future disposal sites is the total disposal cost to the City. The total disposal cost includes not only the gate fees and transportation costs from the SMaRT Station; it also includes the long-term liability to the City for disposing waste at the particular site. There are federal and state regulations allowing federal and state agencies to close down and clean up a disposal site that threatens public health and safety. The agencies also have the authority to seek reimbursement for the cleanup costs from owners, operators and users of the site. For example, the U.S. Environmental Protection Agency, which is responsible for the administration of federal Superfund site cleanups, will identify all previous owners, operators and users of a Superfund site as potentially responsible parties. Regardless of the actual composition of waste delivered, each previous user will be responsible for its share of the cleanup costs (which could be over \$10 million), based on the total tonnage of waste disposed at the site. This long-term liability is especially burdensome for municipal governments since they, unlike private businesses, cannot easily avoid such liability by declaring bankruptcy.

In order to minimize the long-term liability associated with disposal sites, the City should review site design and construction, management practices on checking incoming loads for hazardous substances, and other factors as part of the selection process.

Use of Closed Sunnyvale Landfill and Recycling Center

The Closed Sunnyvale Landfill

Some future uses should be extensions of current uses. For example, additional auxiliary facilities related to solid waste management may need to be developed. A wood salvage area or other form of organic material recovery might be useful in meeting the AB 939 mandate for 50% diversion from landfill disposal. Storing solid waste, recycling, or composting containers for use in various programs might be necessary or beneficial as well. These nonrecreational uses would likely be restricted to the East Hill to minimize impact on open space use of the Recycle Hill, South Hill, and West Hill.

Several other potential uses have been discussed. One is a cooperative project with 4H, which would provide a grazing location for small animals, while simultaneously reducing the cost of grass cutting and fertilization. Another option is temporary or permanent use of the site for ham or commercial radio operations, including training of citizen volunteers in emergency communications protocol and procedures. In general, any land use (including revenue generating activities) that is consistent with the existing land uses and physical constraints may be included in the mix of future uses.

The effects of the closed landfill on the owners and users of the nearby Moffett Park industrial area should be taken into account when considering future uses of the landfill. Some of the landfill's characteristics are potentially detrimental to its neighbors, while other characteristics are an asset to the nearby industrial area.

Due to its elevation and steep slopes, the landfill dominates many views in the industrial area to the south. A well-established grove of eucalyptus trees lines Caribbean Drive and Borregas Avenue north of Caribbean. These fast growing trees provide a visual screen when the landfill is viewed from the south and tend to minimize the bulk of the landfill hills. Some gaps in the line of trees have developed due to construction and the freeze of 1990. A capital project is currently underway to fill in these gaps to restore the screening effect. The City should continue to maintain the landfill screening trees to improve and maintain an attractive appearance for the landfill when it is viewed from Moffett Park.

The portions of the site that will be open to the public offer a unique open space opportunity to those using the site and the nearby levees for exercise. Striking views of the South Bay are available from the landfill, which is the highest point in Sunnyvale north of Evelyn Avenue, three miles to the south. The landfill and the surrounding waterways are habitat for a wide variety of wildlife. These attractive features are similarly beneficial to property owners and industrial occupants of Moffett Park in their efforts to attract and retain tenants and employees. Decisions on future uses of the landfill should identify and consider possible impacts on these neighbors and users of the site.

The close proximity of the landfill, the SMaRT Station, the WPCP, and Baylands Park, all City facilities with a theme of environmental protection, offers an opportunity for the City to display its commitment to the environment. The City should take advantage of this opportunity by using coordinated signage and a comprehensive approach to public education and tours to demonstrate the interrelationships among the four facilities and the City's proactive approach to environmental issues.

Physical constraints on site use are significant and fall into three categories. First, the clay cap over the entire surface of the landfill should not be penetrated or damaged by land uses. Access to the clay layer for inspection and repair purposes is required by regulations that govern the site for at least 30 years following closure.

Second, differential settlement of waste materials must be accounted for in any use. Use of irrigation water will be restricted, perhaps to a lower level than is consistent with some potential uses.

Third and most importantly from a public safety perspective, landfill gas will be present at the site for at least several decades. Enclosed spaces, whether structures or parts of facilities (such as buried conduits and the aggregate beneath a concrete or asphalt surface), can potentially contain landfill gas in explosive concentrations. Attention to this concern is critical during design of post-closure land uses, and equally critical in the inspection and operational protocols for these post-closure land uses. The landfill gas collection system and other environmental control systems on the site must be protected from damage and remain accessible for repairs, adjustments, and modifications.

The Closed Recycling Center

Recycling Center operations are scheduled to be consolidated into the SMaRT Station in 1996. The City has leased a portion of the Carl Road Recycling Center site to the County of Santa Clara for use as a permanent household hazardous waste drop-off facility. This facility will provide an ongoing method for

residents to properly dispose of household hazardous wastes in between the quarterly drop-off events.

The former Sunnyvale Recycling Center site is well suited for this use. It has adequate access for entrance, materials drop-off, and exit from the property. As a first step in establishing this facility, the County will lease a portion of the site for five years and operate a BOP (batteries, oil, and paints) drop-off at the Recycling Center site. BOP materials make up the bulk of the items received at household hazardous waste events. They are also relatively inexpensive to handle and are commonly recycled, as opposed to incinerated or landfilled, as with other household hazardous wastes.

The City should consider the long-term use of the Carl Road Recycling Center site as a permanent household hazardous waste facility.

Another potential use for a portion of the Carl Road site is parking for City employees at the nearby WPCP. With minor modifications, it may be possible for the site to accommodate the household hazardous waste facility at the west end of the site and a parking lot for WPCP employees at the east end.

Conclusion

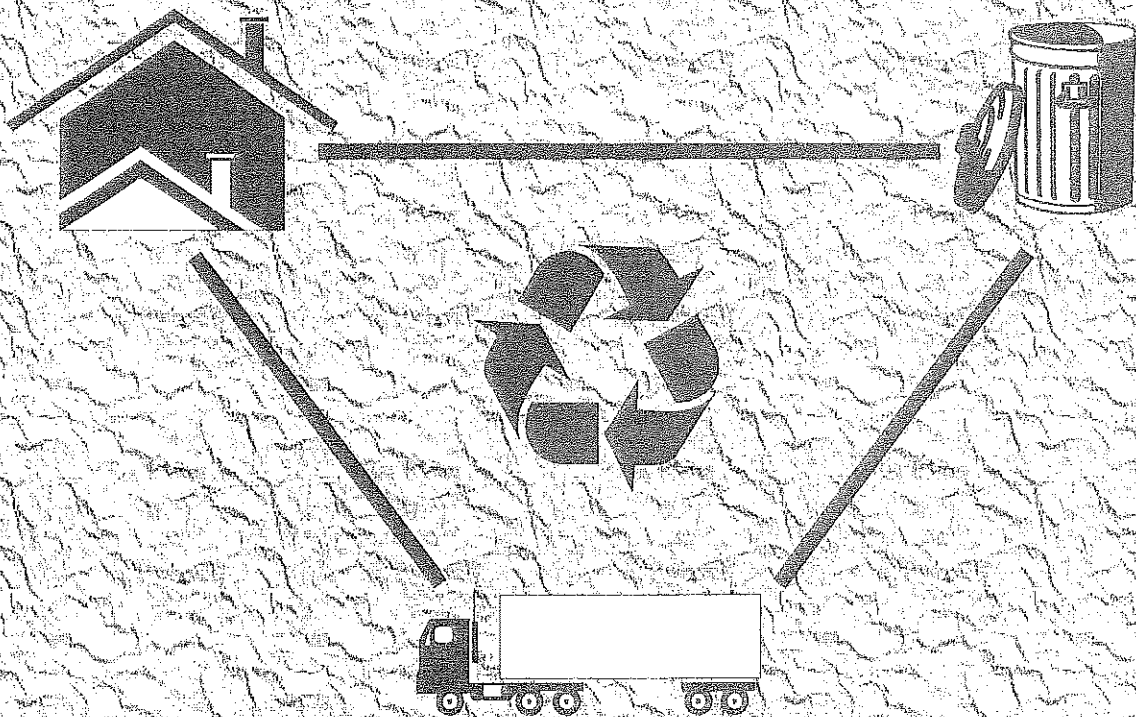
The City has long been recognized for its leading role in solid waste management issues. As mentioned in the California Integrated Waste Management Board's 1994 Annual Report, "(t)he City of Sunnyvale is another community that has responded to the call to reduce waste. Since 1989, their waste diversion has doubled, going from about 18 percent in 1989 to nearly 40 percent today. Their efforts to invest in new waste management technologies and expand their education programs for the public are just a part of their formula for success."

The City currently has a stable solid waste management system that can handle present and future waste streams. The various components have enabled the City to comply with the 25% diversion mandate two years ahead of the 1995 schedule. The City is well on its way to achieving the 50% diversion mandate by the year 2000.

However, because of the successful efforts by both the City and private businesses in source reduction and recycling, the amount of waste disposed has decreased and the downward trend is expected to continue. Since the Solid Waste Program budget is funded almost entirely by refuse rates, it is likely that future rates will rise.

The City's primary challenge over the next twenty years will be to integrate source reduction, recycling, and SMaRT Station recovery programs to achieve the appropriate level of diversion of solid waste in the most cost-effective manner.

Interrelationship with Other Sub-Elements



Interrelationships with Other Sub-Elements

The General Plan of the City of Sunnyvale is composed of seven elements: Transportation, Community Development, Environmental Management, Public Safety, Socio-Economic, Cultural, and Planning and Management. The Solid Waste Sub-Element is part of the Environmental Management Element, which includes six other sub-elements: Water Resources, Sanitary Sewer System, Surface Runoff, Energy, Noise, and Air Quality.

Altogether there are a total of 24 elements or sub-elements within Sunnyvale's General Plan. The interrelationship of the Solid Waste Sub-Element with the goals and policies of those elements or sub-elements that are relevant is summarized below.

Land Use Sub-Element

The Land Use Sub-Element contains the following policies influencing or supporting the Solid Waste Sub-Element's goals:

- Policy A.3: Provide for a full range of commercial uses which will respond to the service needs of the community.
- Policy A.4: Provide for a variety of industrial uses and supporting commercial services.
- Policy A.5: Provide for and encourage the maintenance of open space areas.

Open Space Sub-Element

The Open Space Sub-Element contains the following policy supporting the Solid Waste Sub-Element's goals:

- Policy C.3: Investigate development of a system of multi-purpose trails for recreational uses.

Housing and Community Revitalization Sub-Element

The Housing and Community Revitalization Sub-Element contains the following goal and policy influencing the Solid Waste Sub-Element's goals:

Goal B: Ensure a high quality living and working environment.

- Policy B.1: Continue to encourage property owners to maintain existing developments in a manner which enhances the City. Properties should be aesthetically pleasing, free from nuisances and safe from hazards.

Seismic Safety Sub-Element

The Seismic Safety Sub-Element contains the following policy supporting the Solid Waste Sub-Element's goals:

Policy B.1: **Emergency Response Facilities:** Maintain and construct City facilities utilized for emergency response so that they remain operable after a major seismic event.

Surface Runoff Sub-Element

The Surface Runoff Sub-Element contains the following policies influencing the Solid Waste Sub-Element's goals:

Policy A.2: Comply with regulatory requirements and participate in processes which may result in modifications to regulatory requirements.

Policy A.3: Ensure that BMPs are implemented to reduce the discharge of pollutants in storm water to the maximum extent practicable.

Policy A.5: Prevent accelerated soil erosion.

Policy D.1: Consider the impacts on the water quality of surface runoff as part of land use and development decisions and implement BMPs to minimize the total volume and rate of runoff.

Energy Sub-Element

The Energy Sub-Element contains several goals and policies influencing or supporting the Solid Waste Sub-Element's goals:

Goal G: Conserve energy by maximizing resource recovery and reuse and minimizing energy consumption in the pick-up and transport of solid waste.

Policy G.1: Consider source separation recycling programs.

Policy G.2: Consider establishing waste-to-energy facilities as part of the solid waste management plan.

Policy G.3: Minimize the consumption of nonrenewable fuel required to travel to garbage disposal sites.

Goal I: Minimize energy consumption in the provision of municipal services without affecting the quality or quantity of services.

Policy I.3: Decrease dependency on outside energy resources by increasing City produced energy.

Noise Sub-Element

The Noise Sub-Element contains several goals and policies influencing or supporting the Solid Waste Sub-Element's goals:

Goal A: Strive to maintain or achieve a compatible noise environment for all land uses in the community.

Policy A.1: Consider noise standards in the evaluation of land use issues and proposals.

Goal C: Maintain or achieve acceptable limits for the levels of noise generated by land use operations and single events.

Policy C.1: Regulate land use operations noise.

Air Quality Sub-Element

The Air Quality Sub-Element contains the following goal and policy influencing or supporting the Solid Waste Sub-Element's goals:

Goal A: Improve Sunnyvale's air quality and reduce the exposure of its citizens to air pollutants.

Policy A.1: Require all new development to utilize site planning to protect citizens from unnecessary exposure to air pollutants.

Socio-Economic Element

The Socio-Economic Element contains the following policy supporting the Solid Waste Sub-Element's goals:

Policy A.4: Maintain City facilities and City properties to a high standard of maintenance and promote a positive aesthetic appearance in the neighborhoods.

Recreation Sub-Element

The Recreation Sub-Element contains the following goal and policy influencing or supporting the Solid Waste Sub-Element's goals:

Goal E: Provide and maintain recreation facilities based on community need, as well as on the ability of the City to finance, construct, maintain, and operate these facilities now and in the future.

Policy E.1: Provide, maintain, and operate facilities such as swimming pools, tennis courts, golf courses, athletic fields, trails, parks, arts facilities, community centers, and other specialized facilities in a

safe, high quality, usable condition that will serve and meet the recreational needs of the community.

Fiscal Management Sub-Element

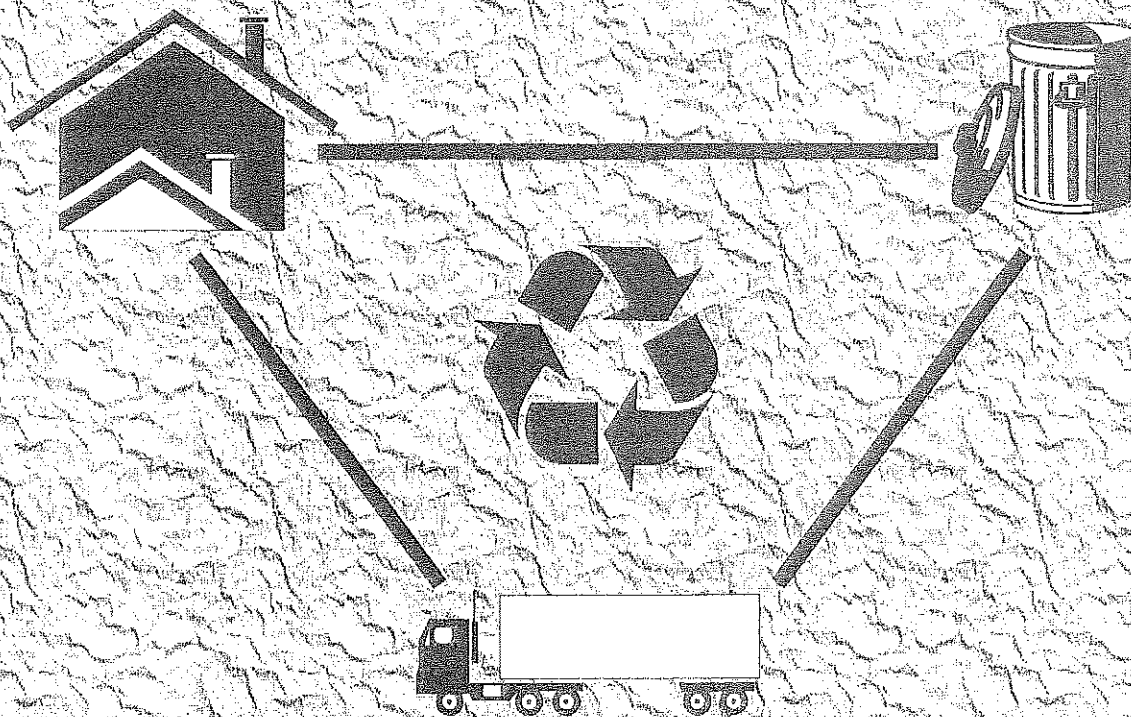
The Fiscal Management Sub-Element contains the following goal and policies influencing the Solid Waste Sub-Element's goals:

Goal A: Revenue: Maintain and enhance the City's revenue base.

Policy A.1: Revenue base: Maintain a diversified and stable revenue base for the City.

Policy A.2: Revenue Forecasting and Monitoring: Develop and maintain a revenue monitoring system to assist in trend analysis and revenue forecasting.

Goals, Policies, and Action Statements



Goals, Policies, and Action Statements

Introduction

This part of the Solid Waste Sub-Element contains a set of integrated goals, policies and actions. The goals and policies reflect the overall direction in which the City wishes to advance. These goals and policies will provide guidance for decision-making when the City is confronted with specific issues and proposals. The action statements outline the specific steps the City is committed to taking in order to achieve the stated goals.

The goals, policies, and action statements within the Solid Waste Sub-Element are based on certain assumptions, which are:

- The citizens of Sunnyvale want a clean city and a healthy environment.
- The quantity and makeup of the solid waste stream generated in Sunnyvale will continue to change over time, in response to economic conditions, technology, and packaging.
- Due to the specialized equipment and expertise of the private sector, it is most efficient and cost-effective to continue to contract for solid waste collection, processing, transfer, and disposal services.
- The trend toward source reduction, design for material recovery and other solid waste reduction and recycling measures will continue to broaden and expand.

Goals, Policies, and Action Statements

Goal 3.2A. Ensure that all municipal solid waste generated within the City is collected and transported in a manner that protects public health and safety.

Policy 3.2A.1. Provide convenient, competitively priced solid waste collection services.

Action Statements

3.2A.1a. Establish, enforce, and periodically update collection service standards.

- 3.2A.1b. Provide collection services that meet the needs of elderly and disabled residents.
- 3.2A.1c. Evaluate methods of achieving increased efficiencies in solid waste collection.
- 3.2A.1d. Compile and analyze information regarding collection operations to ensure that existing operations are operated in a safe, sanitary, and efficient manner and that collection costs are necessary and reasonable.

Policy 3.2A.2. Ensure that standards of Customer Service Excellence policies are met by those providing solid waste collection service.

Action Statements

- 3.2A.2a. Provide and publicize convenient methods by which customer complaints can be filed.
- 3.2A.2b. Investigate all complaints regarding solid waste collection and maintain records of complaint resolution.

Goal 3.2B. Reduce solid waste disposal to 50% or less of the amount generated in 1990 (as adjusted to reflect population and economic changes) in the most cost-effective manner.

Policy 3.2B.1. Reduce generation of solid waste by providing source reduction programs and promoting source reduction behavior.

Action Statements

- 3.2B.1a. Provide source reduction programs that reduce the generation of solid waste.
- 3.2B.1b. Encourage and facilitate private source reduction programs, services, and facilities.
- 3.2B.1c. Provide comprehensive and ongoing public education programs to encourage source reduction behavior by Sunnyvale residents and businesses.
- 3.2B.1d. Continue to monitor the effectiveness of unlimited residential refuse collection.

- Policy 3.2B.2.** Maximize diversion of solid waste from disposal by use of demand management techniques, providing and promoting recycling programs, and encouraging private sector recycling.

Action Statements

- 3.2B.2a. Continue to use demand management in determining refuse collection rates and policies.
- 3.2B.2b. Provide, or facilitate the provision of, recycling collection services to residential, commercial, and industrial customers in a cost-effective way that allows achievement of the 50% diversion goal.
- 3.2B.2c. Provide comprehensive and ongoing public education and promotion programs to encourage residents and businesses to participate in recycling programs.
- 3.2B.2d. Make City facilities models of source reduction and recycling behavior by stating that all employees are expected and empowered to incorporate source reduction and recycling in their work practices.
- 3.2B.2e. Compile and analyze information regarding recycling and disposal amounts, program costs, and customer satisfaction to evaluate the City's progress toward achieving its disposal diversion goal.

- Policy 3.2B.3.** Meet or exceed all federal, state, and local laws and regulations concerning solid waste diversion and implementation of recycling and source reduction programs.

Action Statements

- 3.2B.3a. Periodically update the Sunnyvale Source Reduction and Recycling Element (SRRE), and perform related tasks as required by state law.
- 3.2B.3b. Continue to implement the source reduction and recycling programs described in the SRRE.
- 3.2B.3c. Continue to monitor the City's compliance with waste diversion laws and regulations.

- Policy 3.2B.4.** Increase demand for recycled materials by advocating local, state and federal legislation that will increase use of recycled content products.

Action Statement

- 3.2B.4a. Identify and support proposed laws and administrative actions that would increase the demand for and value of recycled materials in a cost effective manner.

Goal 3.2C. Encourage residents to maintain clean neighborhoods by preventing unsightly accumulations of discarded materials and illegal dumping of municipal solid waste.

- Policy 3.2C.1.** Provide periodic opportunities for residents to dispose of refuse at discounted or no charge.

Action Statements

- 3.2C.1a. Periodically provide "extended curbside collection" of bulky residential refuse.
- 3.2C.1b. Periodically provide City residents free disposal of refuse at the SMaRT Station.
- 3.2C.1c. Provide disposal services for neighborhood cleanup events.

Goal 3.2D. Dispose of solid waste generated within the City in an environmentally sound, dependable, and cost-effective manner.

- Policy 3.2D.1.** Assure that the City possesses a minimum of five years of refuse disposal capacity at all times.

Action Statements

- 3.2D.1a. Annually assess the amount of disposal capacity available with existing disposal arrangements and projected disposal amounts.
- 3.2D.1b. When available disposal capacity equals ten years or less, initiate actions to arrange for sufficient capacity to accommodate present and projected City needs.
- Policy 3.2D.2.** Reduce the amount of refuse being disposed, generate recycling revenues, and minimize truck travel to the disposal site through use of the Sunnyvale Materials Recovery and Transfer (SMaRT) Station.

Action Statements

- 3.2D.2a. Achieve economies of scale in the operation of the SMaRT Station.
- 3.2D.2b. Continue to monitor SMaRT Station operations to ensure compliance with all performance standards and regulatory requirements.
- 3.2D.2c. Research developments in refuse transfer, materials recovery equipment and operations, and markets for recovered materials, and implement appropriate changes to SMaRT Station equipment and operations.

Goal 3.2E. Minimize potential future City liability for wastes generated in the City.

- Policy 3.2E.1.** Select disposal methods and sites for solid and hazardous wastes that incorporate technologies and practices most likely to eliminate or minimize future City liabilities.

Action Statements

- 3.2E.1a. Obtain and review permits, reports, and other information related to disposal facilities to verify compliance with laws, regulations, and prudent practices.
- 3.2E.1b. Whenever practical, select to dispose of hazardous wastes by reuse, recycling, incineration, and landfilling, in that order.

- Policy 3.2E.2.** Minimize impact on future rate payers of potential liability for past disposal practices.

Action Statements

- 3.2E.2a. Evaluate existing reserve funds and potential liabilities and adopt appropriate reserve fund policies.
- 3.2E.2b. Seek changes to federal law to minimize the City's potential liability for disposal of municipal solid waste.

- Policy 3.2E.3.** Minimize illegal and inappropriate disposal of Household Hazardous Waste (HHW).

Action Statements

3.2E.3a. Encourage use of HHW source reduction practices by providing promotion and public education.

3.2E.3b. Provide and promote convenient HHW disposal services.

Policy 3.2E.4. To meet or exceed all federal, state, and local laws and regulations concerning Household Hazardous Waste (HHW) and implementation of HHW programs.

Action Statements

3.2E.4a. Periodically update the Sunnyvale Household Hazardous Waste Element (HHWE) and perform related tasks as required by state law.

3.2E.4b. Implement the HHW programs described in the HHWE.

Goal 3.2F. **Maintain sound financial strategies and practices that will enable the City to provide comprehensive solid waste management services to the community while keeping refuse rates at or below countywide averages for cities using cost of service pricing.**

Policy 3.2F.1. Establish refuse collection and disposal rates in a manner that equitably allocates program costs among rate payers and promotes rate stability.

Action Statements

3.2F.1a. Periodically restructure refuse collection and disposal rates to incorporate demand management, minimize demand for services, and reflect actual costs.

3.2F.1b. Annually survey refuse rates and rate-setting methods for comparable Santa Clara County cities to determine City's relationship to countywide averages.

Policy 3.2F.2. To the greatest extent possible, anticipate changes required in refuse collection rates in response to changes in laws, regulations, and economic factors affecting the solid waste management system.

Action Statements

- 3.2F.2a. Prepare budgets that reflect costs for anticipated legislation and regulations, new programs, and modifications to existing programs.
- 3.2F.2b. Annually establish refuse collection rates that use long-range budget projections to maximize the predictability of future rates.
- 3.2F.2c. Identify, and work to modify, proposed laws and legislation that have potential financial impacts on the solid waste management program.

Policy 3.2F.3. Identify additional revenue sources and, where possible, increase revenues from solid waste programs, services, and facilities without jeopardizing program goals and customer service quality.

Action Statements

- 3.2F.3a. Seek grant funding from the State and other sources where the cost of obtaining and maintaining the grant does not negate its value.
- 3.2F.3b. Identify and pursue potential customers for any unused capacity of the SMaRT Station.
- 3.2F.3c. Review and audit revenue sources to ensure that all appropriate revenues are being received.
- 3.2F.3d. Evaluate revenues of existing and proposed programs as decisions are being made regarding those programs.

Goal 3.2G. Contribute to an economic development environment that is supportive of a wide variety of businesses.

Policy 3.2G.1. Provide solid waste services desired by businesses at competitive rates.

Action Statement

- 3.2G.1a. Conduct periodic surveys to verify that businesses receive useful services at a competitive price.

Goal 3.2H. **Manage the closed Sunnyvale Landfill in a manner that protects the public health and safety and the environment, promotes enjoyable public use of the site, and assists in the achievement of other goals of the Solid Waste Sub-Element.**

Policy 3.2H.1. Ensure compliance with federal, state, and local laws and regulations.

Action Statements

3.2H.1a. Continue to monitor and manage leachate, groundwater, and landfill gas.

3.2H.1b. Continue to monitor and manage the landfill cap, slopes, and surface vegetation.

3.2H.1c. Maintain post-closure maintenance financial assurance mechanism in compliance with regulations.

Policy 3.2H.2. Extract available resources from the refuse buried at the landfill.

Action Statements

3.2H.2a. Provide landfill gas of a quality and at a flow rate suitable for energy recovery.

3.2H.2b. Continue to monitor new technologies for further opportunities to extract buried resources.

Policy 3.2H.3. Provide for safe, enjoyable recreational access to portions of the landfill.

Action Statements

3.2H.3a. Maintain environmental control systems to provide for safe public access to open space portions of the site.

3.2H.3b. Maintain a vegetative screen along Caribbean Drive and Borregas Ave. to enhance the aesthetics of the landfill, as viewed from the adjacent industrial area.

3.2H.3c. Provide information to visitors regarding the site's history and relationship to other nearby City-operated environmental management facilities.

Policy 3.2H.4. Provide for facilities and activities on portions of the landfill that support achievement of the City's solid and household hazardous waste goals and policies.

Action Statements

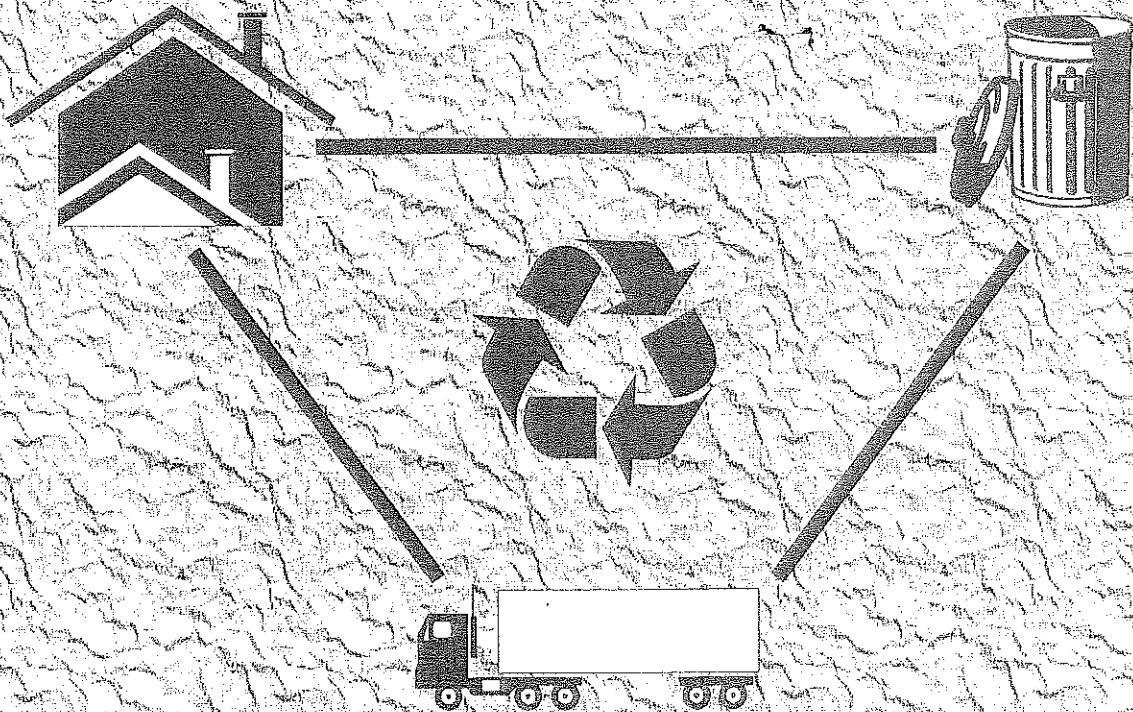
- 3.2H.4a. Continue to provide for concrete and asphalt recycling.
- 3.2H.4b. Consider long-term use of the Carl Road Recycling Center as a household hazardous waste facility.
- 3.2H.4c. Provide a disposal area for dried sewage sludge from the Water Pollution Control Plant.
- 3.2H.4d. Evaluate the benefits to the solid waste program of other waste diversion facilities and activities proposed to be located on the landfill.

Policy 3.2H.5. Generate revenues from post-closure uses of the landfill.

Action Statements

- 3.2H.5a. Periodically evaluate the possibility of increasing revenues generated by existing facilities located on the landfill.
- 3.2H.5b. Evaluate the suitability and revenue potential of proposed revenue-generating uses of the landfill.

Appendices



Appendix 1. Glossary of Acronyms and Technical Terms

Automated Refuse Collection

Collection of residential refuse using a truck equipped with a mechanized arm that lifts, empties, and returns refuse carts to the curb without requiring the driver to leave the truck cab.

BAAQMD

Bay Area Air Quality Management District, the nine-county regional agency that manages air quality issues on behalf of the state.

BMP

Best Management Pactices are management practices promulgated by the Santa Clara Nonpoint Source Pollution Control Program to prevent storm water pollution. Facilities, including various City operations, covered under the Industrial Storm Water General Permit for the Santa Clara Valley have to implement BMPs as part of their Storm Water Pollution Prevention Programs.

BOP

A drop-off facility for Batteries, Oil, and Paints to be located at the former Recycling Center and operated by the County of Santa Clara. The facility will serve residents in the county.

Bollard

A well-anchored vertical post made of metal, wood, or recycled plastic lumber that is installed in such a location as to protect structures and machinery from being struck by vehicles, or to prevent vehicles from entering unauthorized areas such as the landfill.

Buy Recycled

Purchase by individuals, private companies, and government agencies of products manufactured from recycled feedstocks.

Capture Rate

A measure of the efficiency with which various materials can be diverted from disposal by a recycling or materials recovery process.

CIWMB

California Integrated Waste Management Board, the state agency charged with enforcing the state laws related to solid waste disposal facilities and diversion of waste from disposal.

Conditionally Exempt Small Quantity Generator (CESQG)

A business that produces less than 100 kilograms (220 pounds) per month of hazardous waste. CESQGs are regulated differently than larger generators of hazardous waste.

Debris Box (also Roll-off Box)

A large, open-topped metal box ranging in size from 7 to 50 cubic yards in size and designed to hold loose refuse. Debris boxes are commonly used to receive wastes generated by demolition and construction projects. Both the box and its contents are picked up by a winch-equipped truck and transported to a disposal site to be emptied.

Feedstock

Raw material required for an industrial process.

Final Cover

The engineered "cap" of soil, compacted clay, and topsoil that seals the landfill surface. Current federal standards require a total thickness of four feet for final cover.

Flow Control

The use by local government of an ordinance, a contract, franchise agreement provisions, or economic incentives to direct the flow of refuse or recyclable materials to a specific solid waste disposal or materials recovery facility.

Franchise

A right, granted by the City to a private company, to provide a service that makes private use of public rights of way. Examples of franchises granted by the City include those for refuse collection, electricity, telephone, and taxi service. A franchise may be exclusive (only one service provider) or nonexclusive (multiple service providers).

Franchise Fee

A fee paid to the City by a private company for the right to make use of City rights of way (primarily streets) in the course of doing business under a franchise granted by the City.

Hazardous Waste

Waste material that is toxic, ignitable, corrosive, or reactive as defined by state and federal law. Many wastes (e.g. automotive oil filters, household batteries, latex paint) are considered hazardous under state law but not federal law. The hazardous waste category does not include medical waste, asbestos, or radioactive materials, each of which is separately regulated.

Household Hazardous Waste

Hazardous waste generated at residences. Common household hazardous wastes include used motor oil and other automotive fluids, paint, batteries, pesticides, pool chemicals, waxes, and cleaners.

Intermodal Container

A large cargo container capable of being shipped by truck, rail, or cargo ship and easily moved from one "mode" of shipment to another by way of a crane or forklift truck.

Landfill Gas

A gas, composed of methane, carbon dioxide, nitrogen, and trace gases, that is generated by the decomposition of landfilled refuse by anaerobic bacteria (bacteria that thrive in the absence of oxygen). Landfill gas (LFG) usually has a very unpleasant odor, although it may be odorless. Some LFG contains trace amounts of toxic compounds. At some concentrations, LFG is flammable or explosive. Its energy content can be recovered by burning it to generate electricity and heat, or by converting it into a liquid fuel.

Landfill Gas Migration

The movement of landfill gas laterally through soils, pipeline trenches, or subsurface structures. Landfill gas is very mobile and can build up to explosive levels in enclosed spaces if it is not captured by a landfill gas extraction system or vented from enclosed spaces.

Leachate

Liquid that has percolated through or drained from landfilled refuse.

Materials Recovery

The sorting of recyclable materials from mixed solid waste at a central processing facility such as the SMaRT Station.

MRF

Materials Recovery Facility

Post-closure Maintenance Plan

A written plan, prepared by an engineer and subject to approval by various regulatory agencies, that identifies the monitoring and maintenance activities to be carried on after closure of a landfill.

Power Generation Facility

A set of large internal combustion engines to be installed at the WPCP that will use LFG to fuel the production of electricity.

Recycling

The use of discarded materials in the manufacture of new products.

Reuse

The reemployment of an item that would otherwise be recycled or disposed. Examples of reuse include: washing and refilling milk and soda bottles; sale or donation of used furniture, clothing, and appliances; and salvage and resale of construction materials from demolition and remodeling projects.

RWQCB

Regional Water Quality Control Board. The regional agency that enforces state standards designed to protect the quality of groundwater and surface water, including San Francisco Bay.

Secondary Material

Industrial feedstock composed of previously used materials.

Semi-automated Refuse Collection

Collection of residential refuse using a truck equipped with a hydraulic tipper. Refuse carts are moved to the truck by the driver, manually attached to the tipper, and emptied automatically.

SMaRT Station

Sunnyvale Materials Recovery and Transfer Station. Owned by the City of Sunnyvale and located at 301 Carl Road, the \$24.3 million SMaRT Station receives refuse and recyclable materials generated in the cities of Mountain View, Palo Alto, and Sunnyvale, sorts recyclable materials from the refuse, and transfers the residue 27 miles to the Kirby Canyon Landfill for disposal.

Solid Waste

All solid, semisolid, and liquid wastes, including garbage, compostable materials, trash, refuse, rubbish, ashes, industrial wastes, demolition and construction wastes, discarded home and industrial appliances, dewatered sewage sludge, and manure. Solid waste does not include hazardous waste or household

hazardous waste, medical waste, radioactive waste, sewage, or abandoned vehicles.

Source Reduction

Decreased generation of solid waste resulting from reduced product weight or volume, increased product life, product repair, and decreased consumption.

Source Separation

The sorting of recyclable materials from other solid waste by the waste generator.

SRRE

Source Reduction and Recycling Element. AB 939 requires each city and county in the state to prepare a long-term planning document called the SRRE, describing how the jurisdiction will achieve the mandated diversion of its solid waste.

Sunnyvale WPCP

Sunnyvale Water Pollution Control Plant. The WPCP, which treats sanitary sewer waste water, is adjacent to the SMaRT Station.

Tipping Fee

The fee paid for disposal of refuse at a transfer station or landfill.

Transfer Station

A facility where solid waste is transferred from refuse collection trucks to larger "transfer" trucks for transportation to a distant landfill.

Virgin Material

Industrial feedstock obtained by mining ores, cutting trees, or otherwise extracting a resource from its natural setting.

Appendix 2. Legislation on Solid Waste Management

A. Recycling and Source Reduction

AB 939 was signed into law in 1989. It requires each city and county in California to divert 25% of their solid waste from landfill by 1995 and to divert 50% by the year 2000. These diversion mandates will be measured against the baseline quantity of solid waste landfilled by each city and county in 1990. AB 939 compliance is monitored by the California Integrated Waste Management Board (CIWMB). Cities are required to file periodic progress reports with the CIWMB. Cities that fail to comply with AB 939 may be subject to a fine of up to \$10,000 per day.

AB 939 required each city and county to prepare a Source Reduction and Recycling Element (SRRE) describing how the jurisdiction planned to achieve the mandated levels of diversion. Sunnyvale was the first city in the state to adopt its SRRE. The SRRE states that Sunnyvale plans to achieve the 25% and 50% diversion levels by implementing programs in three categories: source reduction, reuse, and recycling.

Another bill related to recycling, AB 2020, requires that a specified number of recycling drop off centers be established in specific areas of the state. Due to the city-wide curbside program, the number of drop-off centers for Sunnyvale was reduced by the California Department of Conservation, which monitors the program. This agency administers the other programs established by AB 2020 (including the California Redemption Value program to encourage recycling of beverage containers) plus grant and loan programs to encourage the use of recycled materials by industry.

B. Landfills and Transfer Stations

The federal Subtitle D regulations, under the Resource Conservation and Recovery Act, stipulate siting, construction, and operating standards for solid waste facilities. These standards are implemented in California by the CIWMB and the State Water Resources Control Board (SWRCB).

The CIWMB designates Local Enforcement Agencies (LEAs) to perform routine inspections and enforcement actions on its behalf. For the Sunnyvale Landfill and the SMaRT Station, the LEA is the Department of Environmental Health, County of Santa Clara. The LEA inspects operating landfills and transfer stations weekly and closed landfills quarterly.

The SWRCB also delegates its responsibilities at the regional level to various Regional Water Quality Control Boards (RWQCBs). The RWQCBs are required

to ensure adequate protection of water quality and state-wide uniformity in siting, operation, and closure of waste disposal sites. Sunnyvale is within the jurisdiction of the San Francisco Bay Region RWQCB.

In addition to the Subtitle D federal standards, the CIWMB, the RWQCB, and the Bay Area Air Quality Management District also have permitting authority for landfills and transfer stations. Permits must be obtained from each agency prior to constructing or operating a landfill or transfer station. These permits are renewed on a regular basis.

State law also requires each landfill owner/operator to submit evidence of their ability to fund the closure and post-closure maintenance of the landfill. Funds for this purpose must be placed into an account to ensure proper environmental protection measures are undertaken upon landfill closure.

C. Buy-Recycled

State and federal laws have been promulgated to require public agencies and private businesses to buy products made with recycled content. The purpose of these laws is to create market demand for the recycled materials that are collected by recycling programs.

State law requires certain state agencies to purchase office products and paper containing recycled content. State law also requires that certain products used in the state (such as newsprint) include a minimum percentage of recycled paper.

D. Hazardous Wastes

The City's program for management of hazardous wastes is described in the Public Safety Element of the General Plan. The City's solid waste management staff coordinates with the Public Safety Department to ensure proper handling of any hazardous waste that is discovered at the SMaRT Station or by the refuse collection contractor.

AB 939 mentioned above also requires each city and county in California to prepare a Household Hazardous Waste Element (HHWE) identifying programs which would divert household hazardous waste (HHW) from landfilling and ensure their safe treatment and disposal. The City prepared a HHWE along with its SRRE in 1991. However changes in state law and regulations required that the HHWE be formatted as a separate document. The HHWE has since been revised and resubmitted for approval by CIWMB.

The solid waste management program is responsible for operating several programs to encourage proper disposal of household hazardous waste and other hazardous waste generated in Sunnyvale. These programs include the Household Hazardous Waste Drop-off Program for Sunnyvale residents, a similar Small Quantity Generator Program for Sunnyvale businesses generating small quantities of hazardous wastes, curbside collection of used motor oil from residents, and a used motor oil, oil filter, and antifreeze drop-off at the SMaRT Station.

These programs must comply with federal, state, and local laws concerning the handling of hazardous waste.

E. Public Health and Safety

Sunnyvale Municipal Code Section 8.16 contains specific requirements for solid waste collection to protect public health and safety. The Municipal Code requires solid waste to be collected on a weekly basis from all residences and businesses. The Code requires solid waste to be stored and placed for collection in specified types of containers to prevent leakage, odor, and blowing refuse. Only contractor(s) licensed and permitted by the City to collect and haul solid waste may do so in Sunnyvale.

Appendix 3. Results from Waste Composition Study, August 1995

Material Type	Sunnyvale			
	Residential	Commercial	Industrial	Total
Cardboard	0.65%	1.90%	1.60%	4.15%
Cardboard(C)	0.92%	0.85%	0.21%	1.98%
Newspaper	0.73%	2.74%	0.40%	3.88%
Newspaper (C)	0.29%	0.78%	0.03%	1.11%
Mixed Waste Paper	1.69%	2.22%	1.88%	5.80%
Mixed Waste Paper (C)	1.55%	2.38%	0.29%	4.22%
High Grade	0.12%	0.46%	0.77%	1.34%
High Grade (C)	0.04%	0.07%	0.03%	0.14%
Other Paper	2.61%	3.07%	0.80%	6.48%
Aluminum Cans	0.07%	0.16%	0.02%	0.25%
Tin Cans	0.22%	0.33%	0.01%	0.56%
Ferrous Metals	0.34%	1.08%	0.31%	1.72%
Non-Fer. Alum. Scrap	0.09%	0.15%	0.01%	0.25%
Bi-Metals	0.07%	0.02%	0.01%	0.10%
CA Redemption Glass	0.16%	0.28%	0.07%	0.51%
Non-Recyclable Glass	0.02%	0.09%	0.00%	0.11%
Other Recyclable Glass	0.30%	0.59%	0.09%	0.98%
Refill. Glass Container	0.00%	0.00%	0.00%	0.00%
1 - PET	0.14%	0.13%	0.02%	0.30%
2 - HDPE	0.31%	0.34%	0.08%	0.72%
3 - PVC	0.01%	0.07%	0.00%	0.08%
4 - LDPE	0.00%	0.02%	0.00%	0.03%
5 - Polypropylene	0.03%	0.08%	0.00%	0.11%
6 - Polystyrene	0.13%	0.26%	0.12%	0.52%
Films	1.28%	2.04%	0.48%	3.80%
Other Plastic	0.56%	0.76%	0.14%	1.46%
Yard Waste-Shrubby	0.30%	0.28%	4.04%	4.63%
Yard Waste-Leafy	0.55%	1.45%	0.20%	2.20%
Yard Waste-Collected	10.31%	0.00%	0.00%	10.31%
Wood Waste	0.62%	0.90%	3.48%	5.00%
Agricultural Crop Residue	0.00%	0.00%	0.00%	0.00%
Manure	0.00%	1.60%	0.00%	1.60%
Food Waste	3.56%	3.23%	0.41%	7.19%
Textiles	1.11%	1.84%	0.71%	3.67%
Leather	0.00%	0.01%	0.00%	0.01%
Household Haz. Waste	0.11%	0.09%	0.05%	0.25%
Inert Solids	0.15%	0.84%	0.43%	1.42%
Diapers	0.97%	0.74%	0.01%	1.72%
Tires & Rubber	0.07%	0.08%	0.04%	0.19%
White Goods	0.00%	0.13%	0.00%	0.13%
Remainder	6.34%	8.25%	6.49%	21.09%
Total	36.46%	40.29%	23.24%	100.00%
Total Tons	2,169.40	2,397.12	1,382.59	5,949.11

Sunnyvale SRRE Subwastestreams

Material	Residential	Commercial	Industrial
PAPER	23.60%	35.93%	25.88%
OCC/Kraft	4.30%	6.83%	7.78%
Mixed Paper	8.90%	11.43%	9.34%
Newspaper	2.81%	8.74%	1.88%
High Grade	0.45%	1.30%	3.44%
Magazines/Glossy Ins.	0.00%	0.00%	0.00%
Other Paper	7.15%	7.63%	3.44%
PLASTIC	6.76%	9.22%	3.63%
Film	3.52%	5.07%	2.06%
HDPE	0.84%	0.84%	0.34%
PET	0.40%	0.33%	0.08%
Polystyrene	0.36%	0.66%	0.52%
Other Plastic	1.64%	2.32%	0.63%
FOOD	9.77%	8.00%	1.75%
YARD WASTE	30.63%	4.30%	18.24%
WOOD	1.71%	2.22%	14.96%
TEXTILE/LEATHER	3.06%	4.59%	3.08%
RUBBER/TIRES	0.19%	0.19%	0.18%
AGRI.CROP RESIDUE	0.00%	0.00%	0.00%
MANURE	0.01%	3.97%	0.00%
OTHER ORGANICS	0.00%	0.00%	0.00%
METALS	2.17%	4.30%	1.51%
Tin F&B Cans	0.61%	0.82%	0.04%
Other Ferrous	0.93%	2.67%	1.32%
Bi-Metal Cans	0.20%	0.05%	0.03%
Aluminum Cans	0.19%	0.40%	0.08%
Non-Ferrous	0.24%	0.37%	0.05%
Other Aluminum	0.00%	0.00%	0.00%
GLASS	1.32%	2.36%	0.72%
Redeemable Beverage	0.43%	0.69%	0.30%
Non-Redeemable	0.00%	0.00%	0.00%
Other Recyclable	0.83%	1.46%	0.41%
Other Non-Recyclable	0.06%	0.21%	0.01%
OTHER INERTS	0.41%	2.07%	1.86%
OTHER WASTES	0.30%	0.55%	0.22%
Appliances/White Goods	0.00%	0.33%	0.00%
Other Hazardous Waste	0.00%	0.00%	0.00%
Household Hazardous Waste	0.30%	0.22%	0.22%
REMAINDER	20.06%	22.30%	27.98%
Total	100.00%	100.00%	100.00%

Appendix 4. Survey results from Public Participation Events

Solid Waste Sub-Element						
Commercial Focus Group Meeting - November 15, 1995						
Choices	Values ranking					Score
Avoiding long-term disposal site(s) cleanup liability	1	1	1	5	2	65
Environmental integrity of disposal site and image of disposal company	2	2	5	7	1	58
Collection service reliability	3	9	2	2	6	53
Collection service cost	7	5	4	4	5	50
Ability to choose from among multiple collection vendors	6	7	6	1	10	45
Speed of response to special service requests	4	4	14	3	9	41
Percentage of my company's waste that is actually recycled	12	3	11	6	4	39
Billings that are easy to understand and provide cost breakdowns	10	6	3	11	13	32
Corporate ethics / reputation / image of collection company	13	8	9	10	3	32
Confidentiality of materials disposed or recycled	8	13	8	8	7	31
Flexibility / variety of collection container sizes and services	5	14	10	9	11	26
Appearance and cleanliness of containers, trucks, and workers	14	12	7	12	8	22
Understanding basis of refuse collection rates charged by the City	9	10	12	14	12	18
User friendliness of service ordering system	11	11	13	13	14	13
Others						
* Please note that participants were asked to rank the fourteen solid waste management issues from 1 to 14. The highest priority item will be given a score of 14 and 1 for the lowest. Items in the above list have been sorted in descending order by their respective scores						

Solid Waste Sub-Element						
Residential Focus Group Meeting - February 27, 1996						
Choices	Values ranking					Score
Collection service cost	2	2	2	4.5		33.5
Collection service reliability	6	1	4	4.5		28.5
Environmental integrity of disposal site and image of disposal company	3	6	7	1		27
Billings that are easy to understand and provide cost breakdowns	7	3	3	7		24
Appearance and cleanliness of containers, trucks, and workers	8	4	1	8.5		22.5
Percentage of waste that is actually recycled	1	9	6	8.5		19.5
Corporate ethics / reputation / image of collection company	4	7	10	4.5		18.5
Flexibility / variety of collection container sizes and services	9	10	5	2		18
Confidentiality of materials disposed or recycled	5	5	8	10		16
User friendliness of service ordering system	10	8	9	4.5		12.5
* Please note that participants were asked to rank the ten solid waste management issues from 1 to 10. The highest priority item will be given a score of 10 and 1 for the lowest. Items in the above list have been sorted in descending order by their respective scores.						

